THE ELECTRICAL REVIEW

THE OLDEST ELECTRICAL PAPER
ESTABLISHED 1872

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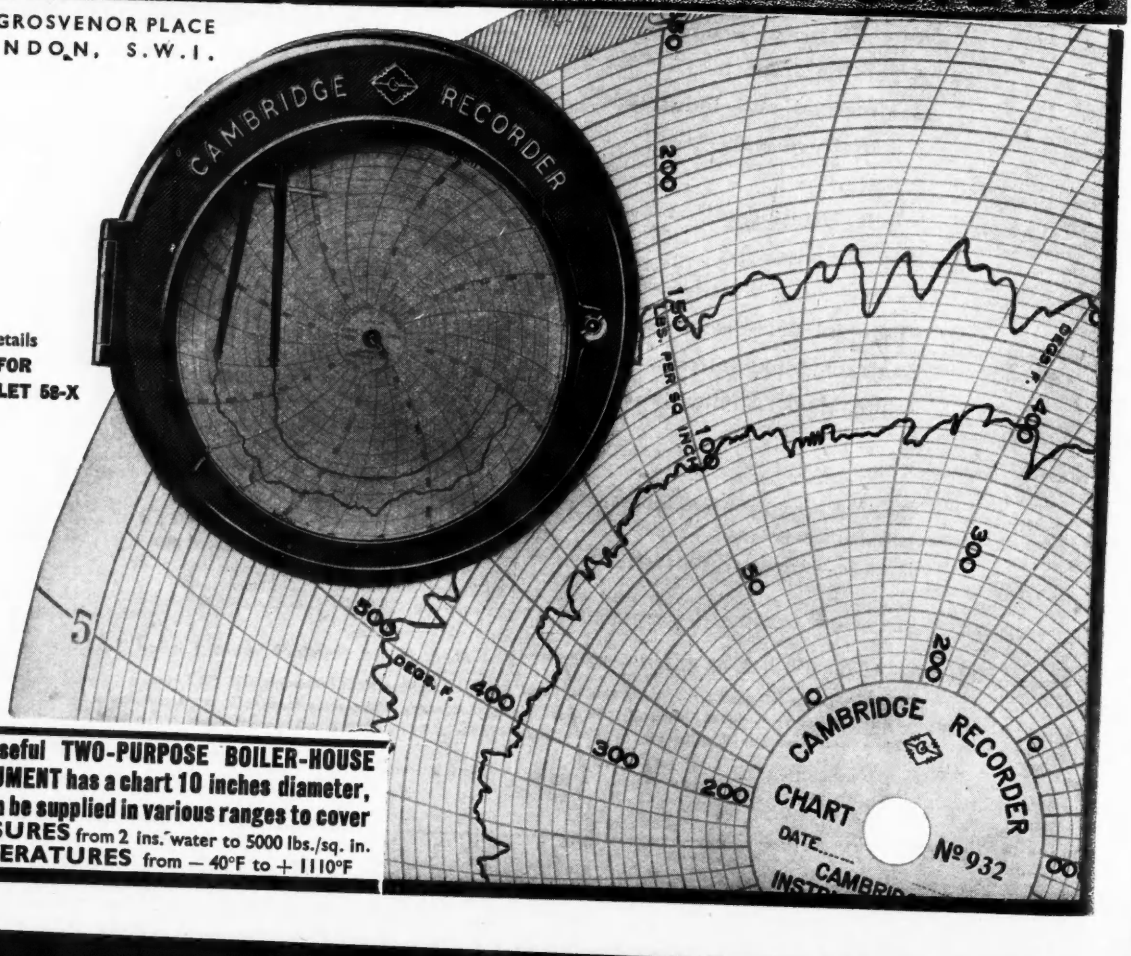

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THE
ELECTRICAL REVIEW

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Vol. CXXVI. No. 3246 FEBRUARY 9, 1940 Price SIXPENCE

Industrial Lighting

Need for Rapid Improvement

HOWEVER great may be the need to walk in darkness in our streets just now, effective defence of the country certainly does not demand a lowering of candle-power standards indoors. Rather the contrary, more particularly in regard to the half-million or more factories, many of which are engaged in producing the armaments and exportable products essential to national self-preservation.

Good lighting in industry has two main purposes. One is to safeguard the health and safety of the worker; the other is improvement in quality and quantity of output. In either case its effectiveness is beyond dispute : it has been demonstrated over and over again. To the usual arguments in favour of adequacy of illumination are now added the considerations that the longer working hours and the partial obscuring of daylight by the methods of black-out adopted further increase the period during which artificial light is required. Also, the greater proportion of older men engaged in manufacture (many for the first time) is likely to call for a much greater supply of lumens than is normally considered ample, especially for the finer work.

Definition and Glare Prevention

These and other factors tend to multiply accidents, fatigue and eyestrain and to make the supervision of inexperienced labour more difficult. Merely to increase the foot-candles available will not produce the desired results, however. Provision must also be made to ensure that objects are seen in sufficient contrast to their background for proper discrimination of detail and at the same time to eliminate glare, which may be quite as bad in its results as a paucity of lumens. This implies, generally speaking, a high value for general illumination with greater local intensities where the nature of the work renders this necessary.

Another outstanding point is the design of fittings to obviate the effects of dirt on their efficiency after, perhaps, a short period. Even though a liberal margin above the calculated illumination intensity may be planned initially in order to cover normal depreciation in useful foot-candles, the falling off in performance may be vastly in excess of this proportion if the light sources and reflectors cannot easily be kept clean. A portable photometer will be found most useful in keeping a check on this. It is in connection with maintenance as well as with the layout of the installation that the value of experienced expert advice is justified by results.

Generally speaking, newer works lighting installations are notably better than the older ones, but there can be few of the latter so bad that a capable illuminating engineer could not bring them up to a reasonable standard. Some of the recent improvement is probably attributable to reductions in the price of electricity. This ought not to have been so, since the total cost of lighting works out at only a fraction of a penny per hour on a man's wages and is negligible compared with the value of his output in a given time.

Minimum Values

In so far as illumination affects the health and safety of the worker it is the concern of the Factory Acts. Minimum values for general illumination are set out in the Fourth Report of the Departmental Committee on Lighting in Factories. These do not define good practice, but merely the limits to which the extraordinary adaptability of the human eye is allowed to be exploited. The Committee's recommendations are still incomplete, since they did not include minima for work requiring discrimination of detail. The omission was, however, due only to the difficulty of giving statutory form to a comprehensive provision that would cover the range of complex and variable processes, each of which calls for a different value of illumination.

Nevertheless, there is no need to await the institution of compulsory minima for detail work. When a suitable method of determining the requisite minima has been devised, the results in practice will, it may confidently be anticipated, support the figures for average service given in " Modern Factory Lighting " — the E.D.A.-E.L.M.A. publication which we recently reviewed—and in the meantime these may be safely adopted.

It is doubtful whether the protection officially afforded to the worker will be enough even then. There are other and less obvious health aspects. Thus the Departmental Report referred to " the purely psychological effects of brighter surroundings " which produced a considerably increased output even when the task was one " which practiced opera-

tors might reasonably perform blindfolded." There is, naturally enough, a limit to the improvement in quality and quantity of output that can be secured by better lighting, but this lies far above the standard too often found in workshops. Lighting as a means to increased productive efficiency is not ordinarily a matter for legislation. Its appreciation is left to the factory owners' enlightened self-interest and to education, as exemplified by the handbook mentioned. The growth of this appreciation, however, may take more time than can be afforded in the present emergency, and it must be asked whether any factory owner who is not making the most of what good lighting can do for him to increase the output of each machine is pulling his weight in producing the goods urgently needed either for our armed forces or for export.

An Export Council

THE Labour Opposition's proposal that a Minister of War Economy should be appointed to co-ordinate the activities of the various Government Departments concerned with production, supply and use of commodities was rejected last week. The Prime Minister maintained that such an appointment would cause friction between the Departments and so far as export trade was concerned would usurp the functions of the Board of Trade. As an alternative the Government had decided to set up an Export Council to assist the President of the Board of Trade, who would be chairman of the Council, with the Parliamentary Secretary of the Department of Overseas Trade as vice-chairman. Lord Stamp would be a member and there would be representatives of business, trade unions and Government Departments. The names of the members were announced just after the Premier's statement. They included that of Mr. S. R. Beale, chairman and managing director of Guest, Keen & Nettlefolds, who is connected with the electrical industry as a director of Mavor & Coulson, Ltd. Until the functions of the Council are specified in more detail it is unprofitable to comment upon its possible efficacy in developing overseas trade. It is to be hoped, however, that it will do something to clear the exporter's difficult path.

Electricity Rationing Ended

BY the revocation of Articles Nos. 10 to 15 inclusive and 23 of the Fuel and Lighting Order the attempt to restrict electricity (and gas) consumption is abandoned after being suspended before coming into operation. It would appear from this drastic action that no further scheme of rationing is to be attempted, which is a wise decision. Already the lighting restrictions and increased charges have put a brake on electrical expansion, making any Government interference superfluous. The vast amount of work which the original Order entailed seems to have been in vain, but, after all, the course of events has not been according to anticipation and little blame can be attached to the Government.

The E.R.A.

THE first serious attempt to organise research as an essential factor in industrial progress was a direct outcome of the 1914-18 war. It is therefore not surprising that at the beginning of another war the Government should, through the Advisory Council of the Department of Scientific and Industrial Research, not only deprecate any reduction of the activities of the British Electrical and Allied Industries Research Association, but officially stress the need for it to be "infused with even greater vigour than before." All the important members of the staff are "reserved" and safety measures have enabled almost normal work to be continued after the first few uncertain weeks, and without removal. It is likely that there will be fewer committee meetings so that greater responsibility is being placed on investigators and the laboratory staff. Programmes have been reviewed to enable more urgent work to be given priority. It is gratifying that the E.R.A. continues to have the full support of the whole industry, but Mr. A. E. Tanner, chairman of the Council, nevertheless urges upon all collaborators the realisation that, while the Government's financial aid is to be continued for a further five years, this assistance will not be on the same scale. An increasing number of reports representing important technical progress, or containing information urgently required by the industry, have been presented to the Institution of Electrical Engineers, and have thus reached more quickly a larger number of persons interested than are directly concerned through the Association's membership. The E.R.A. and the industry are indebted to the I.E.E. for this service. It is pleasing also to learn from the annual report, to which reference is made on another page, that the ever growing mass of new information that is accumulating in the Association's reports is to be made less difficult of access. In consenting to remain in office as president for this year Lord Stamp shares with Mr. R. P. Sloan (1932-34) the distinction of serving as E.R.A. president for two consecutive years.

Prices and the Consumer

OUR note on the suggestion by the Association of Non-Statutory Electricity Suppliers and Distributors (whose name is mercifully abbreviated to "Non-Stats") that consumers should be consulted before any alteration was made in tariffs has drawn a reply from the chairman of the organisation (Mr. J. E. Green). He says that the Attorney-General stated recently that "to make a legal agreement, the necessity to consult the consumer before altering a two-part tariff is essential." Mr. Green is evidently referring to the Wimbledon case, and we hold that the Attorney-General's statement applied to an individual instance. That is, it is not possible to vary the basis of a tariff in the case of a particular consumer without his consent. In the Wimbledon instance the undertaking sought to impose upon the consumer a demand limit and to raise his fixed charge if he exceeded a specified maximum. This was held to be discrimination, which was contrary to Section 19 of the 1882 Electric Lighting Act. There is no legal requirement for an authority to consult its consumers before making an alteration in charge which affects all consumers supplied under a particular tariff.

Consultation and Notification

THE nearest approach to consultation laid down in the Acts is the requirement that undertakers shall give consumers one month's notice of any proposed alteration of *method* of charge (Electric Lighting (Clauses) Act, 1899, Section 31 (3)). In any event, consumers are invariably given due notice of increases (or decreases) of charges, but notification is very different from consultation. In the case of the non-statutory undertakings it is true, as Mr. A. Gamble said in our last issue, that consumers are consulted before a price alteration is made. But there is a world of difference between authorised and unauthorised supply undertakings. The former have, as a rule, a considerably larger number of consumers than a "non-stat" undertaking, and they would have a great deal of difficulty in securing general consent to higher charges, however good a case they might be able to present. On the other hand, the average "non-stat" knows all its consumers personally, as it were, and can consequently arrange matters on a more or less friendly footing.

Not Backsliders

THE following comes from a report of the Maidstone Branch of the Electrical Contractors' Association:—

"Branch meetings are now held at 'The New Inn,' Maidstone, instead of at Wynne's Tea House. . . . Since the Branch does not meet until three o'clock in the afternoon, the new meeting place is not as popular as its name suggests."

This explanation should dispose of any idea that the members meet otherwise than on a strictly business basis.

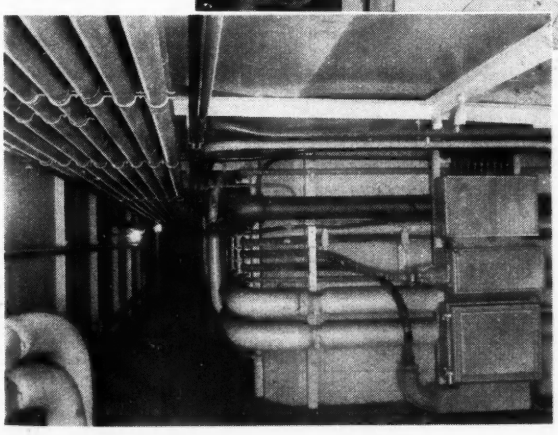
LARGE STORE INSTALLATION

Problems Associated with Distribution

THE growth in the size of modern departmental stores and the greater use made of electricity give rise to many problems of a special nature in the electrical distribution for such premises, and when any large extension is decided upon the whole question may require investigating from an entirely new point of view. By the courtesy of the Birmingham Co-operative Society, Ltd., we recently saw a good example of an installation of this type at the new central premises of the Society in High Street, Birmingham. Some idea of the size of the installation may be gathered from the fact that it embraces 1,300 lighting points, 330 plug points and 115,000 yd. of cable, and has a maximum installed load of 300 kW. The building was erected by the Society's Works Department, Birmingham, whose electrical staff carried out the installation work.

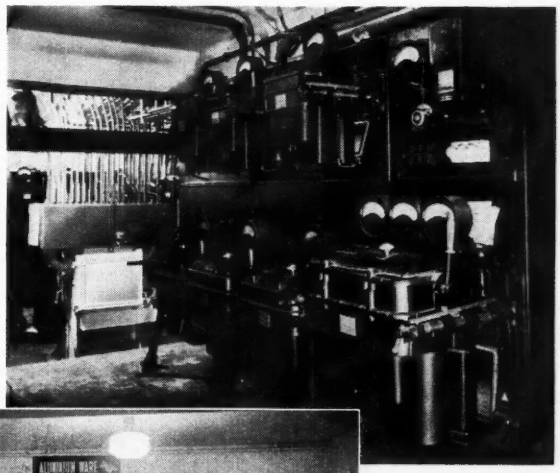
Where, to-day, loads of from 200 to 1,000 kW are installed in individual buildings, the supply authority can provide cheaper and more reliable service, with provision for stand-by, from the high-voltage AC system than is possible from the fully loaded and congested DC network. Thus, the Co-operative Society was told that an increase in demand of about 200 per cent. could only be given from the AC system. Certain advantages in tariff were offered if the whole building were changed over, but these alone were not sufficient to justify such a step.

Applications of electricity for display purposes are being developed mainly with AC equipment, and the tendency for improvement in efficiency of electric lighting appears to be much more marked with AC, using some form of electric - discharge lamp with colour correction, than with any known form which can only be used on DC. These factors were considered important, and a decision was made to change all lighting and some power equipment to AC, and as the supply undertaking proposed to install a 1,000-kVA transformer in the sub-station feeding directly to the consumer's low-voltage supply switch, it was necessary to provide switchgear which would handle the heavy short-circuit currents probable in the event of serious faults.



Subway for cables and other service mains, showing fuseboard with distribution via another riser duct

The power and lighting distribution are normally kept separate throughout the whole installation and separate power and lighting main switchboards are fitted with oil circuit-breakers having a rupturing capacity of 25,000 kVA. The lighting board has nine circuit-breakers and the power board seven, either of 150- or 300-A capacity each. The lighting distribution is divided into three areas with a four-core, 0.2-sq. in. p.i.l.c. cable from the main lighting switchboard. This division is necessary to reduce the number of conduits for the risers to the different floors in the building; otherwise it would be impossible to accommodate the whole of the wiring in the ceilings of the various departments.



Above: Main distribution centre showing (right) lighting switchgear and (rear) fuseboards and conduits entering main riser duct. Left: The hardware department is typical of the excellent general lighting

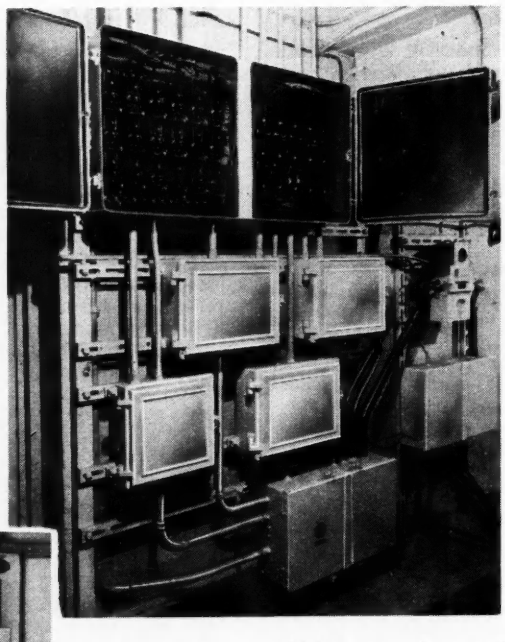
The distribution cables are carried in a service subway which is also used for accommodating the other pipes, etc., for heating, fire protection, gas and water services. At three points main fuseboards are installed for the control of the sub-circuits in the riser ducts, and from these sub-mains are taken to the lighting and power distribution fuseboards situated on the various floors. High-rupturing-capacity cartridge fuses are used to provide discrimination and to make certain that only faulty circuits are interrupted without interfering with the supply to a larger floor area of the building than is necessary.

A scheme to provide against possible cable and switchgear faults and to enable maintenance to be carried out at normal times employs a loop cable and a change-over switch on each main fuseboard feeding the risers. Actually this provides a spare cable which can be substituted for any one of the main feeder cables and provides an alternative emergency supply for both power and lighting.

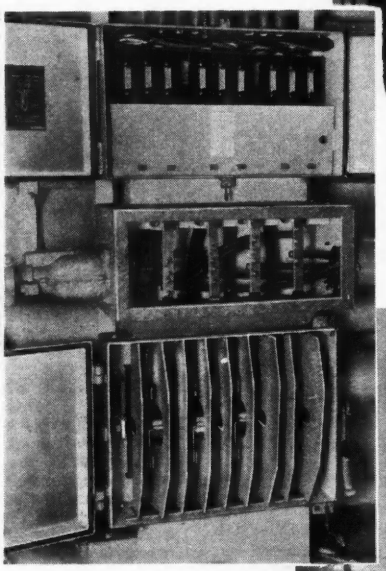
The supply tariff is not separated for power and

lighting, but is based on the total kW demand and a basic rate of 0.5d. per kWh, plus a coal clause. As the distribution systems for power and lighting are separate, however, the supplies may be charged separately if required at any time in the future. This separation between power and lighting makes the distribution far more bulky, because it involves separate conduit systems for each of the distribution schemes. These include lighting, AC power, DC power, Post Office and private telephones, clocks, fire alarms, neon or high-voltage discharge lamp circuits, and inspection and draw-in points which are arranged at the places where these different services have to be brought together before entering the riser duct.

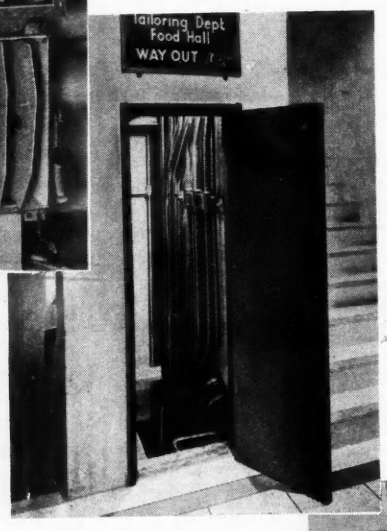
The whole systems have been placed so that all conduits are concealed in the floors, ceilings and walls of the building and so arranged by the provision of inspection and draw-in points that any cable can be replaced at any time in the future or, if required, additional cables can be drawn in.



Right: Central distribution for shop window lighting; remote control by contactors



Left: A loop cable and change-over switches provide an emergency supply at each riser-duct distribution centre



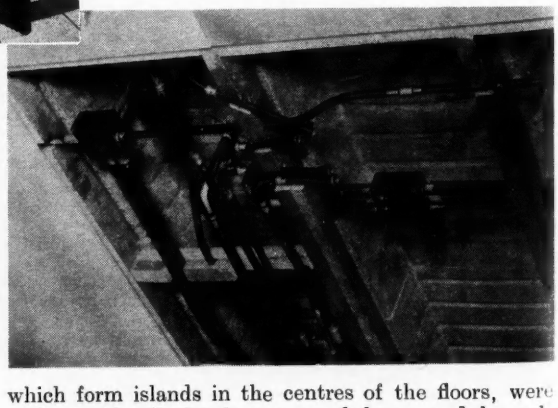
Left: The central riser duct on the staircase suggests excellent co-operation between electrical engineer and architect. Below: Example of the floor construction and method of applying the conduit work, seen from below

With the type of building construction adopted it was almost impossible to use a larger conduit than one inch, owing to the small amount of concrete cover immediately over the main girders. There is ample room between the reinforced floor ribs for junction boxes and conduits travelling transversely to the main girders, and access is provided by having a small removable panel in the ceiling beneath each of these points which are spaced about 30 ft. to 50 ft. apart. All the sub-fuseboards are sunk in the side walls and have solid teak adjustable frames and doors which harmonise with the furnishings, which are mainly in oak.

It was decided to provide general lighting with an intensity of about 12-ft.-candles over the whole of the sales floors, with slight variations for different classes of goods, and various makers were invited to submit samples of fittings for test purposes, and were advised as to the mounting heights and approximate spacings, the latter being governed by the spacing of the projecting beams. Photometric tests were also carried out on the fittings submitted, the following bases being adopted:—(a) The total lumens measured on a plane 2 ft. 10½ in. above the floor level, and (b) the variation in lighting intensity with fittings spaced at 14 ft. centres and constant mounting heights.

The tests were carried out in a portion of a department where suitable facilities existed, and the same lamps were used for each fitting, corrections being made for any slight voltage variation from the standard. According to Mr. R. P. Hulse, B.Sc., consulting electrical engineer for the installation—to whom we are indebted for help in the preparation of this article—the results were astonishing. Some makers submitted fittings which gave a high lighting intensity underneath the fitting, and a hopelessly low figure between fittings, and others submitted fittings which gave a low reading underneath the fitting and a still lower one between the fittings and were very inefficient. The test showed that all the makers' attempts to make the glassware attractive resulted in loss of light, and the more decorative the fitting, the lower its efficiency. On the other hand, the most efficient fitting submitted, which had a 10 per cent. margin in efficiency over any of its competitors, did not appear sufficiently bright in itself, although the lighting results both with regard to distribution and efficiency were excellent. The fitting actually selected was the "Britalux," a stepped cheese-shaped opal glass unit with a very easy and efficient means for securing the glassware.

A large number of "Linolite" fittings are used for interior show-case lighting, and advantage was taken of the full range of shapes of reflectors to obtain the desired distribution in the various shapes of cases. The largest of these cases,



which form islands in the centres of the floors, were made in the Society's own workshops, and by collaboration good results have been obtained with lighting which is concealed from all points of view and with

the minimum possible obstruction of the view of the commodities in the cases.

Generally speaking, cornice lighting was not satisfactory and for displays of china, glassware, &c., better results were obtained by using spotlights partially concealed behind suitable beams in the ceiling and illuminating the full face of the display shelves without projecting any shadows from the customers' hats, &c.

Fluorescent tubes in the restaurant overcome structural difficulties and provide excellent "architectural" lighting

The complete conversion of the restaurant in the old building presented many difficulties, as in addition to the old tubes for cash carriers, sprinklers, heating and other services, it was necessary to accommodate large air ducts of about 4 sq. ft. in section for supplying conditioned air and the removal of all fumes. A false ceiling designed to accommodate all these bulky service pipes rendered the ceiling too low for any type of pendant fitting, and so it was decided to rely mainly upon indirect lighting for this room. Only a moderate height for the coves or reflectors could be afforded, and the use of tubular or standard gas-filled lamps had to be ruled out owing to the large amount of heat which would be developed, and introducing further cooling problems.

The use of fluorescent tubes appeared to overcome all these difficulties and, in addition, gave the opportunity of obtaining light of attractive colours. Architectural fittings have been selected for satisfactory colour blending and a number of partly ornamental fittings using coloured opal glass have been used for the brightening of the side walls and to form a lighting and architectural feature for the tops of the columns.

This form of lighting requires a very large amount of auxiliary apparatus, but by taking full advantage of the false ceiling it has been accommodated in a manner which permits of easy access for maintenance. To comply with the requirement that it must be possible to cut off all supply to fluorescent tube lighting, neon signs, &c. throughout the whole building by operating a switch from the street, all such apparatus is connected to a common system supplied from one main circuit-breaker and this also assists phase balancing and the maintenance of the principle that all apparatus on any floor must be on the same phase.

The fluorescent tube lighting is so arranged that only two-thirds of the room may be used during slack periods, while if it is desired to provide lighting for cleaning the tubes one colour only may be operated on either section and the control of these different sections is effected by means of contactors which govern the supply to group fuseboards on which the individual fuses control the separate transformers. There are twenty-three of these transformers, accommodated in the false ceiling in groups of not more than four in order to reduce the length of high-voltage cable from the transformer to the tubes to the minimum. The transformers weigh 90 lb. each and, with the rest of the equipment, the total weight of apparatus is about two and a half tons.

The total length of cornice for accommodating the tubes is 572 ft. and the pairs of tubes, one for each colour, are arranged so as to give complete blending and uniform illumination of the cove and ceiling. The wall bracket fittings and circular fittings around the columns, &c., are provided with amber flashed opal glass and are intended to provide some brightening for the lowest portions of the ceiling. When the full illumination is used this amber changes to a green tone which harmonises perfectly with the colour of the columns and tones exactly with the "Avodire" panelling and furnishings. The power consumption is only about 6 kW and the lighting intensity is approximately 5 ft.-candles.

In the kitchens and servery at the end of the restaurant no false ceiling is provided to conceal the many air ducts, service pipes and cash carrier tubes (about sixty) which pass through, but excellent results have been obtained by using totally enclosed fittings with silvered glass interiors and obscured glass fronts which are specially designed to give good distribution with a high ratio of spacing to mounting height. These features were introduced to maintain the efficiency of the fittings exposed to kitchen fumes and to distribute the lighting underneath the great amount of ceiling obstructions, including canopies over cooking ranges, &c. All these kitchen fittings and the fluorescent tube lighting were supplied by the General Electric Co.

The whole of the windows in the extension and the new windows in the old building have been lighted by single rows of silvered glass window reflectors and the fittings are carried by means of bronze rings which will permit easy removal of any reflector without having access to the space above the window ceiling. These

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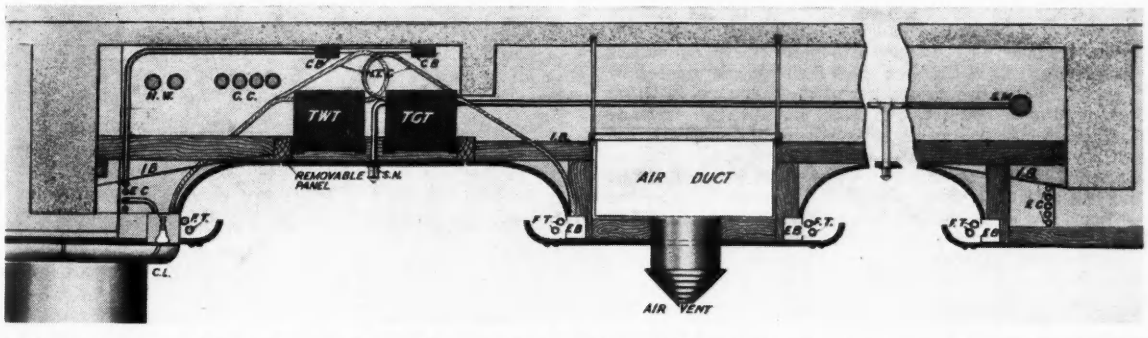


In the construction of the restaurant false ceiling exacting requirements had to be met to accommodate all the electrical equipment for the fluorescent tube installations

C.B., conduit boxes for drawing in cables. C.C., cash carrier tubes. C.L., ornamental column lighting. E.B., electrode boxes. E.C., electrical conduits. F.T., fluorescent tubes. H.T.C., high-tension cable for fluorescent tubes. H.W., hot-water pipes. I.B., lower edge of intercostal beam. S.M., sprinkler mains. S.N., sprinkler nozzles. T.G.T., transformer for gold tubes. T.W.T., transformer for white tubes

PHYSICS OF THE DIVINING ROD

Response to Radiations

"THE divining rod has been used through long ages by magicians, soothsayers and diviners in the search for water, minerals, witches, criminals, Catholics and Protestants, hidden valuables, dead bodies, lost people and even the seats of disease in the human body. In spite of this somewhat dubious history, I hope to show that a dowser may be a scientist who uses his rod to attest to physical phenomena just as the pointer of the galvanometer attests to the current that moves it."

This is from the introduction to Part III of a recently published book "The Physics of the Divining Rod," by J. C. Maby, B.Sc., A.R.C.S., and T. B. Franklin, M.A. (pp. 467; figs. 51. G. Bell & Sons. Price 21s.). The book undoubtedly represents a serious attempt to get to the bottom of the subject, and to put it, if possible, on a scientific basis.

The authors disclaim any concern in the book with psychical forms of divination, clairvoyance, &c., and confine themselves to physical and physiological matters, although the latter are sometimes tinged with traces of the former, which is to be expected from a writer who is evidently keenly interested in both. For example, on p. 23 we are told that a small pendulum is handy for "dowsing" over maps and plans of distant regions. Although the author says that this appears to belong to the "psychic" domain (we should consign it elsewhere) the fact that such a thing is seriously mentioned is calculated to undermine the reader's faith in the author's critical faculty. The authors are fully alive, however, to the shady side of the business "for cranks and charlatans of every kind flock around dowsing as they do around Spiritualism like vultures about a kill . . . to play the rogue as pedlars did with 'holy relics' in medieval times."

Water and the Dowser

The authors are sometimes very definite about the nature of the link between the water and the dowser. For example, on page 173 of part II, which is devoted to the authors' own experimental investigations, they say: "Since the dowser evidently reacts to the same fields of force as such 'ionisation counters' . . . it is evident that the dowser must respond to the high-frequency effects, due to Hertzian radiation . . . his muscles acting both as receiving aerial and detector mechanism." And again, on page 231: "We are only speaking here of fields of electro-magnetic Hertzian radiation, as created by what we believe to be about a 10-metre etheric radiation."

In some sections of the book one's flesh is made to creep by the recital of the dire possibilities of the radiations in which we live and move and have our being, and although, in many ways, the twentieth is an improvement on the sixteenth century, some of the experiences related by Mr. Maby suggest that there is little to choose between being bewitched and being "beradiated." For example: "It is generally agreed that one 'gets along better' on a pedal cycle after dark; so, too, did the writer find that he could always pump more water in less time after nightfall—the later the better, despite fatigue after a long day's work—than in the daytime. . . . The writer sometimes found that he tired much more quickly when (using his two arms) he stood on one side of the pump handle . . . and tests by a second person invariably showed that there was a beam of dowsing radiation from the pump and well-shaft that cut through the position in which one tired of pumping most rapidly."

Another example: "A great proportion of those tested were definitely impressed by the seeming 'change of weight' of, say, a 15 lb. block of iron . . . as compared with some distance off, and they were even more impressed by the fact that the weight seemed considerably heavier when they faced up-stream . . . than when they faced down-stream." Perhaps the palm should be given to the following remark about moving staircases: "It is a common matter of observation—especially by old and sensitive people—that it is much harder work to *walk* up such moving staircases than their static brethren of equal steepness. Such an effect must, *of course*, be due to the 'flow field' (electro-magnetic origin) created by passing over underlying metal work."

Unfair Competition

There is a startling idea for athletes on page 381 where we are told that "it is almost certain that all competitive sports are essentially unfair for not only may one man be more affected by dowsing rays than his competitors and so unfairly handicapped . . . but it is also likely that in a feat such as the high-jump, for example, Jones, jumping from the left take-off, may be in a stronger or weaker zone of radiation than Smith, jumping from the right side! The trial is, therefore, unfair." Visions of a pugilist in the small hours exploring the "ring" with a bent twig and then later manoeuvring to put his adversary "on the spot."

Lay readers are likely to be much impressed by two curves which will, however, do the authors much harm in the eyes of the scientific reader. As the dowser walks away from a stream, he apparently passes through alternate bands of strong and weak fields. If plotted, his reaction therefore gives a wavy line. The author gives such curves and then reproduces the well-known diagram showing the *instantaneous* electric field in the neighbourhood of a vertical Hertzian oscillator and tells readers to note the excellent accordance with the dowsing field, being apparently unaware that the latter is only an instantaneous field diagram and that measurements of the field would show no such waviness.

Theory that Radiations Cause Diseases

A very interesting and important suggestion is that such things as rheumatism are not caused directly by damp but by rays emitted by the water, also that cancer may be caused by radiation from metals, and that the supposed increase in cancer is consequently a result of the increased use of metals in buildings, &c. Even spring mattresses are under suspicion. The metal is presumably excited into radiation by the impact of the cosmic rays. Such suggestions are worthy of the fullest investigation, but we are not so sure of the following: "There is the fact that both the Hertzian field and also the magnetic flow field are for ever reversing their polarities (this is certainly a habit of Hertzian fields) or direction of action on the body of the sleeper—especially if he sleeps extended full length, rather than doubled up in a W form, or with arms and legs stuck out at different angles; for the latter postures would tend to break the oscillatory effects to some extent." This should be a warning to a "sensitive" person—and who knows—not to sleep over "streams or mineral veins" or if compelled to do so, at least to be careful to double himself up "in a W form."

The effects of copper collars and bracelets have been attributed by Labergerie to "ionisation of the air in the magnetic field induced by the metallic oscillators," which sounds terribly scientific and complicated. As a final quotation which summarises the whole: "Our work then gives confirmation of the correctness of the belief held by so many dowsers that 'everything radiates' for on no other assumption can the fundamental phenomena of dowsing be explained."

It would be interesting to take one of those little pendulums used for dowsing over maps and diagrams, and experiment on page 394; we wonder how it would react to "only a secondary phenomena." Seriously, however, there can be no question that this book is the most complete treatise on the subject that has been written, and it will be read with interest—if not with agreement—by all who wish to extend their knowledge of this ancient and much debated subject.—G. W. O. H.

Large Store Installation (*Continued from preceding page*)

fittings are arranged in groups so that various lighting intensities can be obtained and the lighting of the rear portions can be adjusted separately from the front portions of the windows.

These separate sections, aggregating up to 2,000 W each, are controlled by contactors and only the wiring for the operating coils is taken to the control switches. This also permits of re-grouping in one or all of the sections by very slight adjustment of terminal connections in the contactor control board. In addition, the amount of wiring required is reduced and the control board is arranged in the most convenient position without making bulky provision for the wiring. For one group of windows this contactor board is arranged in the basement immediately under the windows themselves and the control board is situated near an entrance door to the food hall. In the other case the control board is arranged above a false ceiling over the windows and the control switches are mounted unobtrusively in the marble covering in the entrance hall. Lighting intensities of up to 150 ft.-candles are obtained with a power consumption of approximately 140 W per foot run.

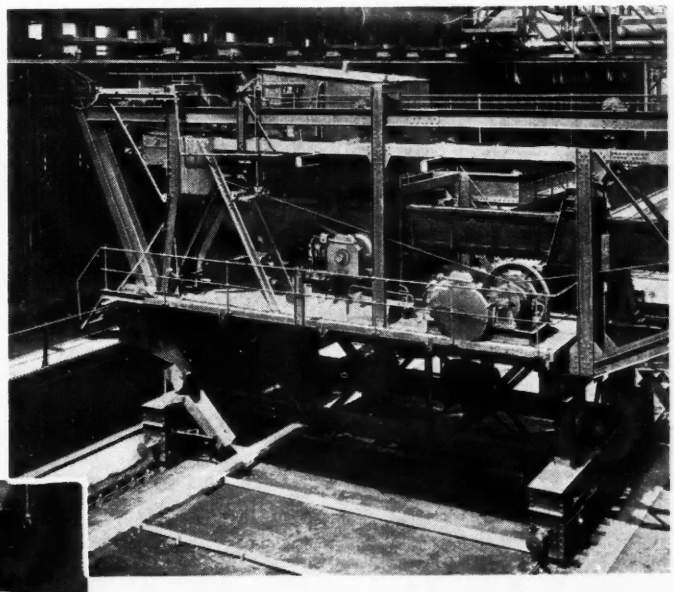
COKE-OVEN PLANT

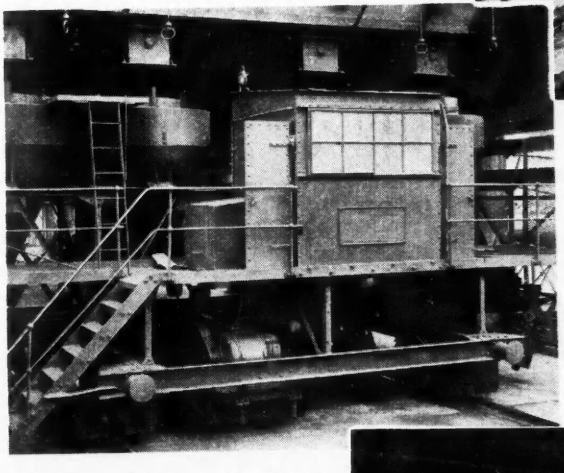
Large Motor Installation

THE following description relates to the electrical equipment of a modern coke-oven plant recently supplied by the Woodall Duckham Co. to one of the largest steelworks in this country. The forty-odd motors, totalling nearly 600 HP, range in size from 2½ to 66 HP, and were supplied by the General Electric Co., Ltd.

The plant consists of 113 cross-regenerative ovens arranged in three batteries and situated on each side of two coal storage bunkers. Each oven can take 14½ tons of coal per charge, and the total daily carbonising capacity of the three batteries is about 2,500 tons. The storage bunkers have a total combined capacity of 3,500 tons. Coal is delivered to the tops of the bunkers by belt conveyor and is distributed by a scraper conveyor driven by a 30-HP 725-RPM slip-ring, totally enclosed, fan-cooled motor served by a contactor-type air-break rotor starter remotely controlled by a push-button switch.

The ovens can be heated by means of either coke-oven or blast-furnace gas, and the system of heating depends upon the reversal of the flow of air and gases in the flues and regenerators at predetermined intervals. Reversal is effected by a series of nearly 500 valves arranged in two alleyways running the full length of the batteries at each side. The operating mechanism of these valves is controlled by two reversing machines, one for each side of the bunkers, each driven by a 10-HP 710-RPM squirrel-cage motor, and the control gear incorporates a timing device which can be adjusted to give intervals of from 20 to 30 minutes between reversals. An automatic alarm draws immediate attention to any failure of reversal.





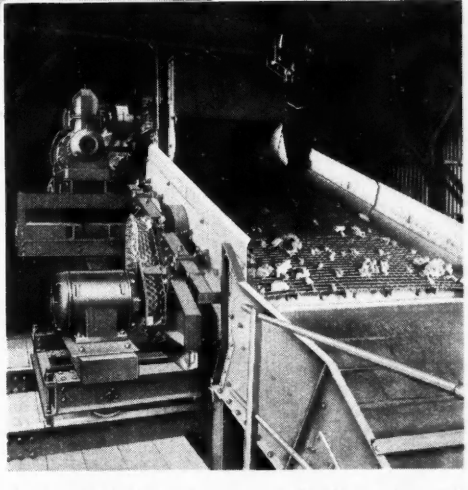
Right: Pusher machine showing 66-HP motor driving ram and 36-HP leveller-bar drive. Below: Coal charging car, with 36-HP long-travel motor

The various machines used for charging and discharging the ovens are all electrically driven by totally enclosed motors running at 705 or 720 RPM. Two charging machines are installed and run on rails on the top of the oven batteries, each machine carrying four steel hoppers fitted with sliding gates and drop sleeves for directing the coal into the oven charging holes. The travel motion for each car is provided by a one-hour rated 36-HP slip-ring motor carried on spring-mounted cast-steel cradles and operating through double spur reduction gearing.

The charge is heated in the coke ovens until the gas has been driven off and carbonisation is complete. The ovens are discharged by removing the doors at each end, and pushing out the incandescent coke; these operations are carried out by two pusher machines and two door machines, which run on a special track at the side of the batteries.

A pusher machine has five operating motions. A hook engages and carries the oven door; an extractor head removes and replaces the door; a ram discharges the coke; a leveller bar levels the top of the coal after charging the ovens; and the whole machine travels along the oven battery. Each motion is driven by a separate motor through reduction gearing. The greatest power is required by the ram, which is operated through a rack and pinion by a 66-HP slip-ring motor. Two similar motors, 36 HP and 50 HP, actuate the rope drum for the leveller bar and the long travel, respectively, while 5-HP and 2½-HP squirrel-cage motors drive the door extractor and door hook, respectively. The extractor is driven through rack and pinion, while the crank for raising the hook, which is carried on the extractor head and fitted with a device for lifting the door latches, is operated by a threaded shaft.

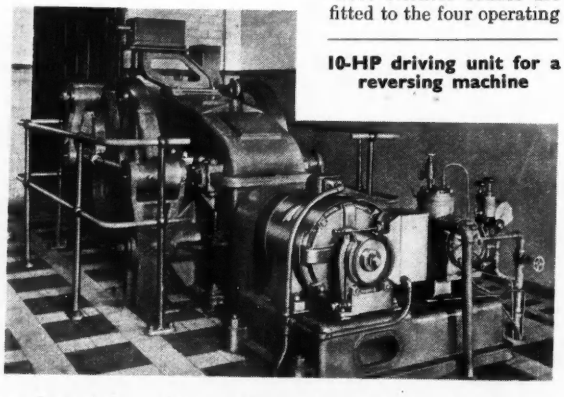
The door machines, which are carried on a platform along the coke side of the ovens, are provided with extractor carriages and heads, each carrying a hook and an adjustable buffer bar similarly to the corresponding motion of the pusher machines. One of the door machines is provided with a slewing mast into which the extractor is withdrawn, the mast then turning through approxmately 90 deg. so as to bring the door into a convenient position for cleaning. Each motion is geared to an individual motor. A 12½-HP slip-ring motor for long travel drives a cross shaft geared to the wheel axles, the 2½-HP hook motor operates in a similar manner to the pusher machine hook motors, and the 5-HP door extractor motor withdraws the carriage by means of a rack and pinion. A similar motor is fitted to the slewing action, driving a pinion which engages with a quadrant at the base of the mast.



Head of 225-ft. belt conveyor feeding "Gyrex" primary screen

All motors on the charging, pusher and door machines are equipped with air-break reversing controllers of the drum type, except the ram motor of the pusher machine for which a cam-contactor controller is used. The control gear on the coal charging, pusher and door extractor machines is electrically interlocked with crane protective panels, since it is essential that the drop sleeves, rams, leveller bars and extractors, shall be fully withdrawn before the machines can

travel. The travel motor on the charging machines is interlocked with the hand lever for lowering the drop sleeves. The maximum travel of the rams, leveller bars, door extractors and slewing device and the long travel of the charging and pusher machines are controlled by suitable limit switches, while solenoid brakes are fitted to the four operating



10-HP driving unit for a reversing machine

motions of the pusher machines and on the extractor, slewing, and hook motions of the door machines.

Coal withdrawn in the levelling operation passes down a chute into a hopper carried on the pusher machine, from which it is discharged at intervals into a skip adjacent to the oven's bunker. When full, this skip is elevated and discharged into the charging car by means of a crane-type hoist operated by a 10-HP 560-RPM motor for hoisting and a 3-HP 545-RPM motor for slewing, both motors being of the totally enclosed slip-ring type.

When pushed out of the ovens the coke, which is incandescent, is directed by guides into a quenching car which travels to the quenching station where water is sprayed on to the coke from an overhead tank. This tank is fed by a centrifugal pump having an output of 60,000 gal. per hr. The pump is direct-coupled to a 40-HP squirrel-cage motor fitted with a contactor type star-delta starter controlled by a float switch in the overhead tank, thus ensuring automatic replenishment of the overhead supply. A similar motor-driven pump is provided as a standby.

After quenching, the coke is discharged on to a sloping wharf where it is allowed to cool. Along the lower side of this wharf are a series of hand-operated finger-type gates which can be opened to discharge the coke on to a belt conveyor which forms the first link in the coke-handling plant. This conveyor is 455 ft. long and 42 in. wide, and is driven by a 20-HP slip-ring motor. It delivers the coke by way of a transfer station to a similar conveyor, 255 ft. long, running at right angles and driven by a 15-HP slip-ring motor. Both of these belt conveyor motors are fitted with air-break contactor-type rotor starters. The coke is then delivered to the screening station where it is graded by a double-deck primary screen and a single-deck secondary screen, both of the Fraser & Chalmers "Gyrex" type. These screens are driven through "Texropes" by squirrel-cage motors of 10 HP and 5 HP, respectively. The screening station is also equipped with a Pennsylvania coke cutter driven by a 10-HP squirrel-cage motor. The screen and cutter motors are switched direct on the line by oil-immersed drum type starters.

From the primary screen the oversize furnace coke is taken by a 36-in. belt conveyor, 575 ft. long, to another transfer station from which a similar conveyor, 326 ft. long, delivers it to a 36-in. wide shuttle conveyor, 148 ft. long, which runs above the furnace coke storage bins and distributes coke into them. These three conveyors are driven by a 15-HP slip-ring and 10-HP and 5-HP squirrel-cage motors, respectively. The squirrel-cage motors have direct-to-line starters, the shuttle band conveyor being of the reversing type, while the slip-ring motor has a contactor-type rotor starter.

All the conveyors on the coke-handling plant are driven through worm reduction gearing direct connected to the motors, which run at 720 RPM and are totally enclosed, being of the fan-cooled type in sizes above 5 HP. Contactor starters are used throughout. To prevent any of the conveyors being started or stopped out of their proper order suitable sequence interlocks are provided on the motor control gear.

Coke bought from outside sources is brought into the works in railway wagons which are tipped by a special high lift tippler on to a small wharf adjacent to the main coke wharf, whence it is discharged on to the main coke-handling system. This tippler is driven by a 20-HP 475-RPM slip-ring motor.

Power-factor Correction

By G. W. Stubbings, B.Sc., A.M.I.E.E.

WHEN an AC supply is charged for under a two-part tariff based upon energy consumption and kVA demand, there is an economic limit beyond which further power factor correction is unremunerative. The maximum possible saving per kW of power demand, and the capacity of the correcting plant required to effect this saving can easily be investigated by the simple graphical construction now to be described. The data required are the uncorrected power factor of the consumer's maximum demand, the tariff rate per kVA of demand per annum, and the estimated annual charge per kVA reactive of correcting plant.

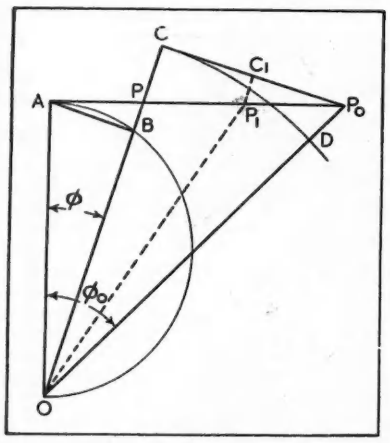


Diagram illustrating results of power-factor correction

In the accompanying diagram, OA is drawn to scale to represent the annual cost per kVA of demand, and the right-angled triangle OAP_o is drawn so that the ratio of OA to OP_o is equal to the uncorrected power factor, cos ϕ_o. A semi-circle OAB is described on OA, and AB is drawn, to the same scale as OA, to represent the annual charge per kVA reactive of correcting plant. OP is drawn and produced, and P_oC is drawn perpendicular to it. P is the intersection of OC and AP_o. An arc of a circle is drawn through C with O as centre to meet OP_o in D.

This construction leads to the following results: The minimum total annual cost per kW of power demand, excluding the energy charge, is represented to scale by OC, and this is made up of OP the demand charge and PC the charge in respect of the correcting plant. The maximum annual saving per kW of power demand that can be obtained by power factor correction is represented to scale by DP_o. The most economical value of the corrected power factor is equal to the ratio OA to OP. The ratio of P_oP to OA represents the rating of the correcting plant per kW of power demand that will give the most economical power factor.

The truth of these conclusions will readily be perceived by a study of the geometry of the diagram. For any corrected power factor represented, say, by the ratio of OA to OP_1, the total annual charges per kW of demand, excluding energy cost, will be represented to scale by the sum of the lines OP_1 and P_1C_1, where P_1C_1 is perpendicular to P_oC. It is evident that the sum of two such lines will be at the minimum when their direction is the same, and when OP_1 is at right-angles to P_oC.

The geometrical construction shows clearly that the total annual charges are affected very little if the corrected power factor is slightly more or less than the most economical value. When, therefore, extensions of power plant are in contemplation, power factor correction can be carried beyond the formal economic limit to meet the future conditions without the overall power costs being affected for the time being by more than a negligible amount. The most economical power factor and the minimum annual charge depend only on the tariff rate and the charges per kVA of correcting plant; they are independent of the uncorrected power factor.

Tin and Its Uses

THE fourth issue of "Tin and Its Uses," published by the International Tin Research and Development Council, announces a new "white-bronze" plating which, it is claimed, out-rivals chromium in its resistance to tarnish and is almost identical in colour and reflecting power with perfectly polished silver.

LIGHTING IN WARTIME

By N. I. B. Harrison

(*E.L.M.A. Lighting Service Bureau*)

WITH the introduction of wartime lighting restrictions many factories found themselves unprepared and in many cases the whole or part of the lighting was reduced unwisely by using blue sprayed or low-wattage lamps, so that operations which it was intended to speed up were made more difficult. The first step towards increasing production should be to obtain good lighting, and this can only be provided if effective black-out methods are in use. Where special difficulties arise in devising permanent black-out schemes, temporary arrangements may prove useful for test purposes. The scheme may either provide for the admission of daylight or can be of a permanent nature requiring artificial light for twenty-four hours per day; or a scheme known as the complementary-colour system which comes between these two methods may be used.

With the complementary-colour system, windows are treated with a special blue varnish and the lamps employed are either sodium discharge lamps (on AC circuits) or tungsten-filament lamps both with special glass envelopes. The special tungsten lamps are obtainable only in the 100-W and 150-W ratings, and their efficiency is low compared with their normal counterparts. Varnished windows admit from 10 to 15 per cent. of daylight, while at night high-intensity lighting that cannot be seen from outside can be obtained from the lamps.

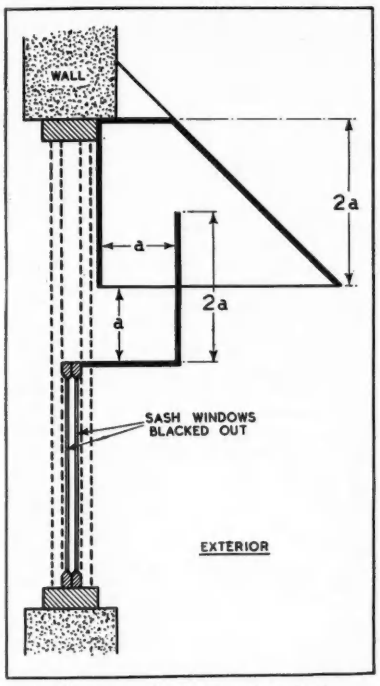


Diagram of window light-lock

Light Locks

The effective screening of doorways and of windows that normally provide ventilation necessitates the use of light-locks. Those at main exits of large factories must be as simple as possible to allow quick and easy transit. The simplest effective form comprises a wall, built opposite the exit, at least five times as long as the width of the opening and roofed at not less than 7 ft.; the roof, walls and floor should be painted matt black to absorb the light. This allows normal lighting to be employed inside the factory, although direct light may have to be screened from the mouth of the light-lock. For the office sections and for certain entrances and exits of some factories, light-locks similar to those recommended (in BS/ARP 15) for shops may be found practicable. When hand trucks have to be wheeled from one building to another a simple light lock can be constructed on the principle of the air lock, having a pair of self-closing swing doors at each end, the first set of doors shutting automatically before the truck reaches the second. For lorries, vans or bulky articles, hand-operated doors can be used.

Light-traps to permit the use of a window for ventilation purposes can be built either in place of the window, or fitted to it so that it can be opened or closed. Light-locks in exposed positions should be so constructed as to withstand the weather and to prevent rain reaching the normally matt black interior surface and making it shiny enough to reflect light. Existing ventilator systems may need further external screening; for those fitted with slats matt black paint should first be applied to the latter.

No external lighting is allowed unless the work is of national importance, and then only with the special permission of the chief officer of police. Fittings constructed to BS/ARP 16 and 20, provide for permissible illumination intensities of 0.002 and 0.02 ft.-candle at ground level, mounting height of 10, 15 and 20 ft. being catered for by variation in the colour of the reflector interior. Lamps of 15-W in the first case and 100-W in the second are used for the three heights, but with the fitting constructed to BS/ARP 21 providing 0.2 ft.-candle at ground level, the variations in the mounting heights are accompanied by the use of 15, 25 and 40 W lamps. Even illumination is obtained over a wide area, and for the two lower-intensity fittings, the spacing to mounting height ratio must not be less than 4 to 1 and, for the third 2 to 1. The use of 100-W lamps for the 0.02 installation might seem excessive, but these fittings at a 10-ft. mounting height cover an area of at least 1,600 sq. ft., thus requiring only 1 W to illuminate 16 sq. ft.

Fitting providing a high intensity of diffused light over a limited area

No restrictions have been placed on the lighting of factory interiors providing that complete obscuration is obtained. It is in fact urged that good seeing conditions should be provided, since Government tests have shown that production is increased by correct standards of illumination. Dilution of labour will naturally cause a slowing up of production per operative and the new worker especially, who will be subject to much greater strain than the skilled worker, must have good seeing conditions.

Unless the lighting installation is completely reorganised when night work is increased a fall in production rate will probably occur, especially where parts of factories previously used for rough or medium work are converted to precision work which requires a much higher level of illumination. In one case where fine work was normally undertaken during daylight, the drop in production by artificial light amounted to nearly 50 per cent.

Discharge and High-intensity Lighting

The extent to which discharge lamps can be used will depend among other things on the degree of colour discrimination necessary and may be increased by employing a mixture of mercury discharge and gas-filled tungsten lamps. An open-type reflector similar to the standard dispersive reflector can be obtained to take such a combination; where a diffused light is required, a combination fitting similar to the industrial diffusing reflector is recommended. For extra fine work and for work on polished surfaces much better results will be obtained from a light source of large area.

Although the high intensity of illumination required by precision work, such as extra-fine assembly and inspection, can be obtained by a concentrated local lighting fitting, trouble is likely not only from reflected glare, but also from contrast in brightness between the object under examination and its surroundings. Indirect light of high intensity provides illumination on the horizontal and vertical planes and reduces shadows to a minimum; it is particularly suitable for the examination of shiny or polished surfaces and for the reading of scales and gauges, since no bright spots of light are reflected into the eyes. In the interests of economy localised sources of highly diffused light may be provided by means of overhead trough fittings, the lamps being placed in a "cap-upwards"

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ELECTRICAL RESEARCH

The 1938-39 E.R.A. Report

CONSEQUENT upon the outbreak of war the annual luncheon of the British Electrical and Allied Industries Research Association is not to take place this month. The annual report for the year ended September, 1939, explains that a new agreement for continued Government financial support through the Department of Scientific and Industrial Research was secured, though not on the same scale as in the previous quinquennium. A larger sum of £48,000 has now to be found to qualify for the block grant of £12,000 and the sliding scale grant has been reduced to 13s. 4d. in the £, but the D.S.I.R. has agreed to maintain the maximum grant at £26,000 without reduction. Last year the Association again earned the maximum grant on the old scale, but it will not be possible to do so this year. For the time being every additional £3 provided by members will secure £2 from the Government.

Last summer £7,500 had to be allocated to the further enlargement of the laboratory and new equipment cost £1,500. This money is payable this year, being covered by sums carried forward.

Heating of Buildings

Among newer developments is the study of the heating of buildings by electricity, with special reference to schools, where there is scope for work on the economical and technical sides. There is need for instrumental aid in dealing to the best advantage with distribution systems, and inquiry is being made as to available network analysers. The comprehensive study and trials of fire fighting in relation to electrical plant has been actively pursued to a conclusion (see ELEC. REV., January 19th and 26th, 1940).

The series of reports on radio interference issued by the Association forms probably the most comprehensive survey of the subject that has been made; of twenty-one reports available six were issued last year by the Association at a nominal price and are distributed free to interested bodies, such as the British Standards Institution and the Institution of Electrical Engineers, by whom they are used in preparing standards and regulations.

The fundamental work being done on the subject of dielectrics is increasing in interest and importance, but is as yet mainly of a type appealing to the expert, like the fundamental research on magnetic materials which Prof. W. L. Bragg has continued at Cambridge University. The X-ray work has advanced to a further stage and a guide has been obtained as to the qualities of an alloy which give it a high coercive force and so make it suitable for permanent magnets as well as indicating the thermal treatment required to produce the coercive force. In addition to the explanation of the structure of Fe_2NiAl in relation to its magnetic properties, some progress has been made in explaining the properties of "Alni" and "Alnico." The Association has co-operated with the Permanent Magnet Association in the production of permanent magnet materials of industrial interest, and some reports are expected to be available shortly. The properties of permanent magnet materials formed from crushed alloys of the "Alni" type have shown the limitation of their field of practical application; as compared with the solid alloy, their remanence is less than one half, their coercive forces are identical, but their magnetic energy contents are only a quarter to a third.

Surge Studies

In connection with surge recording on behalf of the Central Electricity Board, reference is made to modifications of klydonographs and potential dividers in order to overcome troubles due to atmospheric pollution. To the equipment which has been in Nigeria since 1938 for investigating natural lightning there has been added a point-discharge recorder developed by the E.R.A.; a detailed account of its construction is to be prepared shortly.

Fresh ideas for surge protection have been successfully pursued. An entirely new device, which will be known as the "E.R.A. surge filter," was developed during the year. It consists essentially of inductance and resistance in parallel, connected in series with the line, together with a three-electrode gap connected between the line and earth. The two parts of the three-electrode gap can conveniently consist of the external and internal parts of an ordinary expulsion gap. This device is extremely effective, particularly on waves having a very high amplitude. It greatly reduces the steepness of front of all applied waves, and also effects a very great reduction in the amplitude of all waves which are considerably in excess of the minimum spark-over voltage of the gap; waves which are not of sufficient amplitude to produce the latter effect are not likely to endanger sub-station apparatus, even if protection were not provided. In addition to the development work, a model suitable for use in actual service has been constructed.

A special air gap suggested by the director, Mr. E. B. Wedmore, attempts to combine the advantages of horn and sphere gaps. The expected advantages were obtained under dry conditions and it might prove useful in places where it is possible to provide protection against the weather.

For the measurement of lightning currents it has been decided to equip the towers on one of the ring mains of the Central Electricity Board, over 1,200 of them, each with two magnetic links of a new type which has been evolved in collaboration with the Metropolitan-Vickers Electrical Co., Ltd. The new link is capable of indicating currents over a range of 50 to 1, as against 10 to 1 with the links previously employed. By the end of the year the links were ready, and sufficient of the mounting brackets to permit the beginning of installation.

Agriculture and Horticulture

Work has been carried out on electrically heated grain sprouting cabinets, in conjunction with the School of Rural Economy, Oxford University, and a report has been prepared (Ref. W/T3). Under this category, too, comes work on electrically heated poultry rearing appliances, in conjunction with the South-Eastern Agricultural College, Wye, and with Reading University, and preparations have been made for carrying out work on soil heating by electricity, in conjunction with Nottingham University College, and on soil sterilising in conjunction with the Horticultural Experiment and Research Station, Cheshunt. Research on the improvement of the load factor of farm grinding plant, in conjunction with the Institute for Research in Agricultural Engineering, University of Oxford, is also directed to developing to the full the labour-saving possibilities of electrical operation.

The exploration of new applications of electricity included the heating of young pigs, in conjunction with Reading University, and the use of electrical methods of killing eel-worms in narcissus bulbs, in conjunction with Nottingham University College and the Agricultural Experimental Station, Kirton, Boston. As a consequence of the war, research on light irradiation of growing plants has been abandoned, owing to the difficulty in screening illuminated glasshouses at night.

Steam Condensers

Research on the corrosion of condenser tubes is still largely confined to the biological side. A suitable static test for the corrosive action of bacteria, which complies with both corrosion and bacteriological requirements, has been developed, and the technique has been improved and modified to bring the conditions nearer to those found in practice. The identification of bacteria has been continued, and their characteristics and biochemical reactions have been established in many cases.

Corrosion associated with hydrogen sulphide in the cooling water has been noted, particularly when operating with a closed water system or during shut-down periods. Corrosion of the armouring wires and the brass tape used in the internal wrapping of submarine cables, due to contamination with hydrogen sulphide in the tank during transport, has also been noted. Extensive investigations have been carried out on the bacteria capable of reducing sulphate to hydrogen sulphide, and on their inhibition by the use of certain dyes.

Lighting in Wartime (*Concluded from previous page*)

position, and highly polished metal cups fitted to the lower part of the lamp, so that the light emitted is reflected on to the matt white surface of the trough interior. Localised indirect lighting of high intensity can also be obtained by projecting light on to a lowered ceiling or canopy.

Where directional diffused lighting is required, such as may be given during the daytime by side-window lighting, projector type fittings arranged to throw their light on to white blinds, drawn over the windows, gives excellent results, since the operator works under similar conditions of lighting whether daylight or artificial. If this method is adopted means other than blinds must be employed to obtain an effective black-out.

An investigation of the corrosion damage caused by electrical earthing to metal water pipes and mains, undertaken at the request of the Institution of Civil Engineers, is now in progress. It has included the development of methods of measuring stray currents flowing in pipes and in the soil. For this purpose, a valve voltmeter which will measure simultaneously direct and alternating potentials down to 1 mV has been developed.

Glass Insulators and Control Gear

A few further tests have been made on the effect of power arcs on glass and porcelain insulators, in order to clear up some discrepancies left unaccounted for in previous work. A comprehensive paper has been prepared dealing with the effect of power arcs, heating by solar radiation, impact resistance, impulse electric strength, and performance in humid and polluted atmospheres, with a view to presentation to the Institution of Electrical Engineers.

Research on cements for glass inserts in flameproof gear was concluded and the available information on three main types of cement likely to be of service was forwarded to the British Standards Institution and Mines Department (reports Refs. G/T114 (calcium sulphate and iron types) and G/T115 (litharge and glycerine)). The former cements, while only recommended for the use defined, may be suitable for other work if certain precautions outlined in the report are taken

Several further reports on the maximum experimental safe gaps for flanged containers for various gaseous atmospheres (pentane-air, acetylene-air, benzene-air, ethyl-ether-air and acetone-air) have been issued to members.

The interest in arc-extinguishing devices protected by E.R.A. patents continues, as shown by the number of the devices which are being installed in power systems in this country. Since the grant of the E.R.A.'s side blast baffle patent, over 1,500 circuit-breakers of high rupturing capacity have been manufactured under licence, many of these being for higher ranges of rupturing capacity and voltage.

Owing to the urgency of work unforeseen last year (A.R.P. arrangements, &c.) extensions for the accommodation of the fuse and contactor researches have not yet been completed, but a heavy current transformer has been installed and has been of considerable use both in the study of transients in circuits and of mechanical effects of short circuits on cables. The addition of a duplicate battery (with a few extra cells) will, when put in series with the existing one, raise the DC obtainable from 230 to 500 V and in parallel with roughly double the current output.

Potential Indicators

The Home Office recommends that before attempting to earth any line or apparatus preparatory to working on it, steps should be taken to determine whether or not it is in fact dead. The Association has specified a reliable potential indicator which can be conveniently used under field conditions by workmen for this purpose. No existing type of apparatus was entirely satisfactory, and the instrument which has been constructed gives a quantitative voltage indication and discriminates between conductors which are directly connected to a source of supply and those which may be coupled electrostatically or inductively to a live circuit or may carry a residual charge. It is in the form of a high series resistance with a detector which may be a sensitive microammeter or a neon tube voltmeter. A report shortly to be issued to members will describe apparatus suitable for use on overhead lines.

Correspondence

Every letter must be accompanied by the writer's name and address preferably, but not necessarily, for publication. The Editors cannot accept responsibility for correspondents' opinions

Circuit-breaker Contacts

THE experiments described by Mr. J. Anderson in his article in the ELECTRICAL REVIEW for February 2nd are of interest as indicating the desire on the part of manufacturers for improved arcing contact materials. Mr. Anderson has tried a somewhat unusual variety of contact materials, including cast iron, wrought iron, steel and aluminium, but he certainly has not done justice to the metallurgical research which has been carried on during the past several years with the object of developing contact materials for heavy duty.

It is true that copper in the presence of free acetylene (a condition, incidentally, which should never arise in welding) forms an explosive copper acetylide, but such a compound is not formed in the case of brasses containing a fairly high percentage of zinc. For this and other reasons, therefore, arcing contacts of brass possess certain advantages. They still fall, however, very short of the ideal arcing contact material in that their comparatively low melting point may cause local fusion and welding.

The problem has been attacked successfully by quite a different method. By the technique of powder metallurgy, in which a high-temperature sintering operation is employed, it is possible to prepare combinations of two or more metals in which the desirable properties of each are retained to a large extent. In this way combinations such as copper-tungsten, silver-tungsten, silver-tungsten carbide and silver-molybdenum have been produced, and are now being used successfully as arcing contacts in many types of switchgear. These materials combine the desirable properties of the softer metals of high conductivity with those of the hard, wear-resisting refractory metals. They will withstand the destructive effects of arcing and yet be capable of giving continued service with a minimum of attention, while protection is assured for the main contacts. Whether used in high-voltage, distribution, or industrial switchgear they give long life, greater resistance to burning and sticking, and reduced costs of maintenance by comparison with contact materials formerly employed.

In a number of cases the availability of these heavy-duty contact materials has made just that difference between failure and success where freedom from welding of the contacts is essential.

L. B. HUNT.

London, E.C.1, *February 5th.*

The Wider Outlook

Your editorial comments of January 26th included a reference to Mr. A. A. B. Martin's suggestion that the education of electrical engineers is, in general, too narrow. On the day I read this I attended a branch E.C.A. luncheon at Luton where Mr. Rennie Dean, the borough electrical engineer, made a speech in which he stated that the somewhat intensive education required by would-be electrical engineers precluded them from entering into a full social life at an age when social education was likely to have an effect on them for the rest of their career. He suggested that this reacted unfavourably on the industry as very few electrical engineers were able to make a good impression on the general public when it was necessary to make out a case for electricity.

It appears to be impracticable to alter the existing educational system which requires a concentration of effort at the university age. But does it require such a high standard of technical education for a youth who intends to join, for instance, the sales staff of an industrial concern? As an electrical contractor I am amazed at the number of B.Sc.'s, A.M.I.E.E.'s, &c., who call on me representing manufacturers. Obviously men in such positions must have enough technical knowledge to talk about their firm's products and to understand their customers' problems, but would not an education which included a course of economics and which, speaking generally, was a business education be more suitable?

Electrical engineers take themselves too seriously. Very few have enough outside interests, and in the mass they are usually extremely dull except when on their own subject! Is this due to the type of boy that eventually becomes an engineer?—surely we are not all recruited from amongst the objectionable bespectacled children who are "so clever with the wireless"—or is it that our social graces are suppressed at our technical schools and universities?

How can we improve things? Do we want more functions after the style of the I.E.E. Conversazione or do we want more of the E.C.A. Convention type where "Bonhomie" is spelt with a capital "B" and we take our wives to entertain each other while we talk electrical contracting.

No, surely what we want is not to be so intense and not give the impression that electrical engineering is an important branch of black magic. Most of the "big shots" in the industry have attained their position by business acumen rather than technical knowledge, which suggests that the attainment of an honours degree under present conditions requires too great a sacrifice to be worth while. The ELECTRICAL REVIEW is definitely a "serious publication for a serious industry." One can read from cover to cover without finding a gleam of humour. Could we not have a little laugh at ourselves from time to time?

A. F. PLUMMER.

Luton, *February 2nd.*

[There is an occasional "gleam" in the REVIEW, but humour (like beauty) lies in the eyes of the beholder.—EDS. ELEC. REV.]

INSTITUTION PROCEEDINGS

Opportunities for Development. Remotely Controlled Typesetting. Radio Direction-finding

Load-building in Wartime

THE informal meetings of the Institution of Electrical Engineers in London were resumed on January 29th when the president, Mr. Johnstone Wright, showed by means of a graph how war conditions had affected the output of the Central Electricity Board, indicating a serious fall in consumption, largely due to the loss of evening shop lighting.

The principal speaker was Mr. F. W. Purse, chief engineer of the London and Home Counties J.E.A., who, on the assumption that they could go forward once more, advocated renewal of publicity and propaganda with full support of E.D.A.

Showroom demonstrations should be renewed with increased vigour with the aid of hints on wartime cooking, avoiding waste, use of substitutes, effective indoor lighting and danger to eyesight, and general advice and assistance on many home topics. A word of warning was that much apparatus had been hurriedly installed in canteens, often unsuitable for use by the unskilled volunteers in charge. Unsatisfactory operation would cause discontent and criticism that might do a great deal of harm to future development. These temporary installations should be carefully "nursed" so as to advance and not retard the progress of electricity.

Agriculture as an essential to the life of the community was rapidly growing in importance, and here was a great opening to substitute electricity for man-power, and a switch for lighting and heating instead of imported oil and pennyworths of coal. Electric vehicles and trolley-buses should be exploited to the full. The lighting restrictions had caused many complaints of stuffiness in offices and homes where electricity was not used, and this was an excellent opportunity to demonstrate the benefits of electricity and the opportunities of economy.

Domestic Apparatus Pool?

The transfer of population had caused dislocation to supply undertakings carrying on hire and hire-purchase of apparatus. Many were finding difficulty in meeting their requirements, others were being compelled to store returned apparatus, and had the capital lying idle. Why not pool resources, instead of one undertaking still pressing a maker for new cookers while another had a surplus on hand? The mutual benefits of this and similar schemes were apparent.

Mr. Purse's main theme was that rationing and restriction of electricity were "nonsensical and national suicide." He urged that savings demanded by the Government would be best obtained by a greater and not a lesser use of electricity. It had all the virtues and none of the vices of other forms of lighting, heating and power. Labour and material could or should be found for an extended use of electricity and so give financial, material and physical benefit to the nation.

Telegraphic Typesetting

IN a paper which was read at the Institution of Electrical Engineers in London on February 8th Mr. H. H. Harrison discussed typesetting by telegraphic means and the remote control of type-casting machines, for page-printing as distinct from teleprinter reception on narrow tape.

A brief incursion into the theory of typography indicated that the simple process of letter-counting permissible in the case of the page-printing telegraph equipment became one of integration of the variable body-widths of the individual type in a line of composed matter.

The practicability of telegraphic typesetting resulted from the invention and application of the integrating counting indicator to a keyboard perforator whereby the operator was able to judge of the "castability" of a composed line of matter before closing the line. The remote control of the caster in the case of machines of the Monotype Corporation class was shown to be practicable, and alternative methods of effecting this were described.

Machines of this class already possessed the keyboard perforator and the integrating indicator, and with the modifications detailed in the paper could be controlled telegraphically with the same facility as could line-caster machines of the class offered by Intertype, Ltd. To control telegraphically a line-casting typesetter no alteration whatever was made to the machine. All that was necessary was to attach a control unit; this operated the mechanism ordinarily controlled by the key levers, which it was not necessary to remove. The controller was operated by the telegraph signals sent over the line in seven-unit code.

Between the receiving perforator and the line-casting typesetter a translating device was interposd which took the tape, read it letter by letter by means of a device designed by the Teletypesetter Corporation, anl set in motion power-driven mechanism to operate a group of permutation bars. An accepted method of positioning these bars was directly by means of a perforated tape, and Murray-Creed printers were examples of such practice, but to-day the tape was merely used as a controlling means and between it and the permutation bars a mechanical relay device was interposed. Each setting of the permutation bars selected the desired key-bar of the typesetter, and the key-bars tripped the matrices from the magazine one after the other and thus set up the line for casting.

A typical production scheme for a newspaper office using line-casting machines was described. Methods of inserting extra items or withdrawing them from a received perforated tape were illustrated and described. The application of tele-typesetter apparatus, even where telegraphic control was not exercised, was claimed to lead to an increase in operating efficiency since a higher output was reached. While the most striking advantages of such apparatus were realised in the case of newspaper installations, it was also applicable to cases in which composing and casting machines were not situated in the same building. The financial results of tele-typesetter operation were said to be highly satisfactory.

The control of line-casting machines by a perforated tape enabled matrix selection to proceed at maximum line-casting speed. Pauses on the part of the compositor were not so liable to be carried over to the machine and, as in telegraphy, indirect control was superior to direct, since there was a reservoir of tape to draw on, and speed irregularities on the keyboard were smoothed out. Touch operation by keyboard, with greater speed and accuracy, was a contributory cause of higher operating efficiency with indirect control. So much was this so that even when there was no question of control over a line wire it had been found economical to operate a line-casting machine from a keyboard perforator adjacent to it.

Increased Output

A comparison with a tele-typesetter gave 400,000 ems per week against 234,000 ems for manual operation, an increased output of nearly 60 per cent. which allowed ample provision for the capital cost of the additional equipment and charges. Tele-typesetter installations in America had shown an annual yield on the investment, after deducting operating expenses, of as much as 70 per cent.

One of the advantages of tele-typesetting was that the perforated tape was a convenient means of storing composed matter for reprints, as type could be recast at a fraction of the cost and in much less time than that of manual resetting. To reset the type it was only necessary to re-run the tape through the control unit. There was no necessity to keep type standing, and thus savings in storage space and valuable metal were effected.

The *Scotsman*, working between London and Edinburgh, possessed the largest tele-typesetter installation in the world. The bulk of the "copy" was now cast by 9 p.m., using nine tele-typesetter-equipped machines. Formerly, under manual operating conditions, this process was not finished until midnight. The *Glasgow Herald* had installed tele-typesetter equipment for remote-control operation between London and Glasgow. Tele-typesetting had made considerable headway in America, and its prospects in Europe were beginning to look promising before the outbreak of war.

Progress in Eire

THE increasing consumption of electricity in Eire was commented upon by Dr. T. A. McLaughlin in his address as chairman of the Irish Centre of the Institution of Electrical Engineers in Dublin on January 25th.

In ten years the electricity sold had increased from 48 to 276 million kWh, excluding that used for traction in the year ended March last. In the same period consumers had increased from 50,000 to 160,000. At present the total population of the areas served by electricity was 1,200,000, leaving some

1,700,000 living in territory yet unserved by electricity mains.

Regarding electricity used for domestic purposes, Dr. McLaughlin said that a reasonable estimate would be 84,000,000 kWh in 1939. Outside the two large cities the figures showed an even greater advance. The consumption for industrial motive power had risen from 2,000,000 to 65,000,000 kWh.

The primary need, continued Dr. McLaughlin, was to supply the great mass of the population engaged in agricultural production, for whom electricity was not yet available, but extension to the rural community was not made any easier by the economic difficulties of the time. As engineers, they could not close their eyes to the growing inefficiency in community effort. Whatever their knowledge or capacity, results would be negligible unless their services were effectively utilised. There was a clear parallel to the present protective tendency in the development of electricity distribution itself. The necessity for protective equipment for a growing system was obvious; but no less obvious was the danger of the protective measures becoming so complicated as no longer to serve any purpose. Unless this tendency in the community machine were checked, there would undoubtedly be still more difficult times ahead.

Mr. F. R. Unwin, Belfast, proposing a vote of thanks, referred to Dr. McLaughlin's part in bringing about the Shannon scheme, and said he was one of the lucky people who had lived to see their dreams come to fruition. Mr. T. J. Monaghan said that Dr. McLaughlin had given them every reason to hope that the engineers of Ireland would make a contribution to that country's future progress.

Mercury-vapour Lamps

PRESENT trends in the development of mercury-vapour electric-discharge lamps were outlined in a paper by Mr. J. N. Aldington, which was read before the London Branch of the Association of Mining Electrical Engineers on February 6th.

Stages in production were indicated, together with features and properties common to differing types, it being explained that the 80-, 125-, 250- and 400-W sizes were developed primarily for street lighting, designed to operate at high efficiency, and to have a long, useful life. They were self-igniting at ordinary mains voltage, the discharge passing from 5 to 6A and the drop across the tube being about 20V.

The author explained in simple language what happened within the bulb during the evaporation of the small globule of mercury, and examined the reason for the characteristic blue-green cord of intense light produced, differentiating between the low-pressure fluorescent type and lamps in which the vapour pressure might exceed ten or even twenty atmospheres.

Water jacketed lamps were usually of the high-voltage, low-current type. The arc was conveniently linear, about 50 mm. long and 1 mm. in diameter for the 2,000-W size. With the air-cooled type it was feasible to produce both spherical and disc-like arc forms. For vapour pressures greater than ten atmospheres it was essential that the minimum temperature of the bulb should be above 600 deg. C. Dimensions must be properly related to wattage dissipation, the bulb usually being given an isothermal contour. Symmetry of the bulb about the axis of the electrodes was also desirable, as thereby the powerfull convection currents produced in the mercury vapour caused the least disturbance to the arc.

For a spherical arc form the electrodes must generally be separated by a distance not greater than twice their diameter, under which conditions the arc could be made stable without deflecting shields. The leading-in wires must continuously carry from 50 to 100A; one foliated molybdenum seal would carry 20A continuously, and for larger currents a number of such seals were combined.

Greatest brightness in a 2-kW lamp with electrodes spaced 5 mm. apart occurred immediately adjacent to the electrodes at the cathode spots. Brightness distribution at right angles to the axis of the arc indicated a peak value of 74,000 candles per sq. cm. in the central core of the discharge, declining gradually on each side of this maximum.

Light Colour

Colour analysis revealed that in the region of most intense ionisation the light more nearly approximated to that of an incandescent radiator. In contrast with that from the mercury-vapour discharge at low pressures, the radiation was much richer in the blue and red regions of the spectrum, probably due to the extremely high temperature which obtained at the central core of the discharge. Owing to the fact that a very large amount of energy was radiated from a very small area, these lamps were eminently suitable for projection work, for searchlights and other purposes for which a focused beam was required.

Between the two extremes of high and low vapour pressures there was a region of operating conditions in which lay all the remaining practical forms of discharge lamps. In some the mercury vapour itself served as the light source. In others its colour was modified by admixture with other metals, or by fluorescent powders coated on an outer bulb surrounding the arc tube proper. Each had its special purpose and properties, and indicated the remarkable flexibility of electrically excited mercury vapour as a source of light.

Scattering of Radio Signals

EARLY investigations with a short-wave Adcock direction finder showed that signals from strong commercial radio stations receivable within the skip zone were in general characterised by absence of bearing. The causes of this effect were analysed in detail in a paper by Mr. T. L. Eckersley (Marconi's Wireless Telegraph Co., Ltd.) which was read before the Wireless Section of the Institution of Electrical Engineers in London on February 7th.

The author's investigations were first carried out with an Adcock direction finder; they were later made more definite and accurate by utilising short impulses from high-power short-wave transmitting stations (Cable & Wireless, Ltd.), so entirely confirming the original deductions, which were that the signals were scattered by irregularities in the structure, both in time and space, of the "E" layer of the ionosphere, coupled with the formation of ionic clouds that rapidly disperse in a few seconds.

The phenomenon was considered to be a major factor in practically all transmissions. The scattering by ionic clouds of incident waves would include lateral and vertical deviations of the ray path which might spoil the directional stability required for the successful operation of such aerial systems as the "M.U.S.A.," designed to mitigate the distortion produced by multiple-echo reception.

In direction-finding the irregularities in the path limited the accuracy obtainable, since the scattering produced an actual lateral deviation of the ray, which would thus affect the aerial system, even though free from polarisation error. The scattering effect might also include the possibility of echoes becoming split, even where no magneto-ionic effects were involved, since rays might reach the receiver by different paths depending upon whether they encountered a cloud *en route* and upon the degree of scattering involved. Thus a more complex echo pattern might be produced than would be expected from the simple ray theory alone.

In transmission between England and Australia, when the number of multiple echoes might be nine or even as many as twelve, the echo pattern would be very complex and difficult to interpret when the scattering effects were added to the complications caused by oblique incidence and magneto-ionic splitting. Moreover, as the angle of arrival between a high-order echo and the next higher order (ninth and tenth) was only about two degrees and the RMS deviation in the vertical plane due to scattering for such high-order rays would be of the order of three degrees, the accidental angular variation of any two adjacent rays might be greater than the difference between the mean values, and the rays would be inextricably mixed. This had actually been observed in transmissions received at Chelmsford from Melbourne. Instead of the echo pattern presenting a complicated but defined set of multiple echoes, it was a jumbled mountain range of peaks in which it was impossible to identify any stable system of echoes.

Large Neon Clock

A ROTATING neon clock of unusual dimensions has recently been erected on top of a Stockholm building and is visible all over the city. It has been constructed by the Swedish Ericsson Co. for the large department store, Nordiska Kompaniet, whose emblems are formed in light-green neon light on the back of the clock, while hands and contours on the face are illuminated in red.

The dial diameter is 23 ft. and the minute hand is 14 ft. long and weighs 95 lb. The clock, which rotates at a rate of 4 RPM, has a total weight of 7 tons and the length of the neon tubes is 340 ft. It is mounted on a mast of seamless-steel tube, inside which is the shaft which turns the clock, being driven by an electric motor in a room 39 ft. below. Two radial and one thrust S.K.F. ball bearings support the total load, the balls in the radial bearings being of about the size of billiard balls.

An electrically driven master clock gives minute impulses which are transmitted through a shaft inside the main shaft. The 22-mm. diameter neon tubes and the transformers are connected according to the Asea-Technique system, which enables the light strength to be regulated from the motor room.

PERSONAL AND SOCIAL

Information regarding new appointments and other matters of interest for this page are welcomed

INTERNATIONAL Combustion, Ltd., have appointed **Mr. E. M. Highton** as their official agent for Eire and Northern Ireland. Mr. Highton, who is a native of Dublin, served his apprenticeship with the Dublin Dockyard Co., and since 1924 has been on the staff of International Combustion, Ltd. He will handle all inquiries for water-tube boilers, mechanical stokers, coal and ash handling equipment, air heaters, &c., and also the Riley robot automatic stokers for domestic and industrial applications. He will also attend to the sale of paper insulated, lead covered cables up to 11 kV manufactured by Aberdare Cables, Ltd.

Mr. H. R. Forbes Mackay, former general manager of the Sydney County Council Electricity Department, has been appointed Chief Censor for Communications in New South Wales.

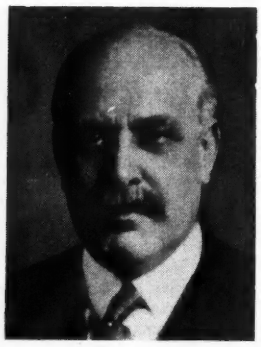
Mr. R. F. Hatto, sales manager of S. Wolf & Co., Ltd., has been elected to the board of directors. Excepting for war service in the last war Mr. Hatto has been with the company since 1913.

Mr. E. H. Scholes, at present constructional engineer to the Huddersfield Corporation, has been appointed by the Lancaster Corporation to the position of assistant engineer in connection with the extension of the generating station. The appointment is for a period of two years.

Birkenhead Corporation Electricity Committee recommends the appointment of **Mr. H. D. Offer,** of Folkestone, as assistant meter superintendent.

Major G. C. Milnes, city electrical engineer, Lancaster, has received the authority of the Corporation to accept the invitation extended to him by the Central Electricity Board to become a member of the North-West England District Consultative Committee.

Lord Stamp has been re-elected president of the British Electrical and Allied Industries Research Association for the ensuing year. He is also a member of the Export Council set up to assist the President of the Board of Trade, reference to which is made in a leaderette in this issue and in our "Commercial and Industrial News" section. Lord Stamp is president of the London, Midland and Scottish Railway and was president of the British Association in 1936.



Lord Stamp

Sir Andrew Duncan, the President of the Board of Trade has been returned unopposed as one of the M.P.s for the City of London.

Sir John Reith, Minister of Information, was the only candidate nominated in the Southampton by-election on February 1st and therefore became the new M.P.

Dr. R. Lessing has taken over the editorship of *Fuel in Science and Practice* in succession to the late Prof. Wheeler. The journal has joined interests with the Institute of Fuel and has been adopted as the research journal of the Institute.

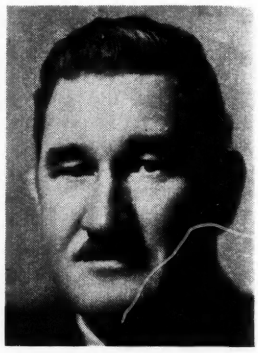
Mr. F. Richardson, of the R.A.O.C., who was formerly on the engineering staff of the Petersfield Electric Light Co., and latterly assistant engineer with the Mid-Southern Utility Co., was married recently, whilst on leave, to Miss E. G. Carpenter, who has been in charge of the Petersfield Company's office and showroom. The manager and members of the staff at Petersfield made presentations to the bride.

The annual staff dance of R. Darbyshire & Co., electrical and radio engineers, Deansgate, Blackpool, on January 24th, attracted over 100 employees and friends. **Mr. R. Darbyshire,** the principal, proposed the toast of staff members who have joined the Forces. The M.C.s for whist were Messrs. J. Royles and W. Taylor, and for dancing Mr. MacVay Ellis. At midnight there was a cabaret by members of the staff, and there were also lucky spot and novelty prizes. Mrs. Darbyshire presented the whist awards.

Mr. C. G. Stoll has been elected president of Western Electric Inc. of America, in succession to Mr. E. S. Bloom, who recently retired. Mr. Stoll has been vice-president in charge of operations and has spent his entire business career of thirty-six years with the company. Since 1928 he has directed all Western Electric operations.

Mr. W. A. Harriman, of A. Reyrolle & Co., Ltd., and **Mr. F. G. H. Bedford,** of C. A. Parsons & Co., Ltd., have been nominated as members of the Newcastle Area Advisory Committee to be established to advise area boards on problems of supply affecting the fighting Services.

Mr. A. Stanley Shier, who for some years has been responsible for the sales and marketing of Atlas electric lamps for Thorn Electrical Industries, Ltd., has now been appointed a director of the company.



Mr. A. S. Shier

Mr. G. Gunn (Edinburgh) has been elected to succeed Mr. P. S. Jolin as president of the Electrical Power Engineers' Association. The new vice-presidents are **Mr. P. L. Weir** (Portsmouth) and **Mr. H. A. Gray** (Manchester).

Mr. C. E. R. Biggin, superintendent, installation and motor department, of Sheffield Corporation Electricity Department is to retire on superannuation this month.

Accrington Corporation Electricity Committee has appointed **Mr. N. Cutler,** switchboard attendant, to be shift engineer.

Mr. L. Dyson, of the Stalybridge, Hyde, Mossley and Dukinfield Transport & Electricity Board, has been appointed service engineer to the Walsall Corporation Electricity Department.

Obituary

Mr. H. A. Neale.—We regret to record the death of Mr. Harold A. Neale, A.M.I.E.E., which occurred on February 1st after a long illness. Mr. Neale had been trading since 1922 as H. A. Neale & Co., electrical engineers and contractors, of High Holborn, London, W.C. He spent a good deal of his early life with Crompton & Co., Ltd., Chelmsford, and also served in the P. & O. line, being a member of the Batti-Wallah's Society. He was in partnership in the City prior to starting up on his own account.

Mr. W. F. Roberts, manager of the Manchester branch of Philips Lamps, Ltd., died on January 31st at the age of fifty-eight. Mr. Roberts had held the position of branch manager since joining the company in 1926.

Mr. H. W. Ravenshaw.—By the death of Mr. Henry Willock Ravenshaw which occurred on January 12th, at the age of eighty-one, the electrical industry has lost yet another of its pioneers. Mr. Ravenshaw obtained his first engineering experience in the railway shops and also in engineering works on the North East Coast. In 1886 he was with Goolden & Trotter, at Halifax, where he was associated with the late Mr. Ll. B. Atkinson designing dynamos and motors. Later the firm was amalgamated with Easton & Anderson of Erith, and Mr. Ravenshaw spent a few years in their service designing electrical plant including some of the first electrical lifts for the underground railways. In the early 90's he joined Mr. R. Booth and practised as a consulting engineer. Mr. Ravenshaw was the patentee of a magnetic clutch which was applied to electrically-driven units such as ram pumps for hydraulic work, reversing tables of planing machines, &c., and he incorporated one of these clutches in a motor car which he built himself in 1900. In 1919 he took Mr. C. F. Dyer into partnership and continued in active business until the firm was removed to Doncaster in 1925 when Mr. Ravenshaw took up his residence in Grasmere and eventually retired from the business in 1930. He was an active member of the Institution of Civil Engineers and contributed many papers to that Institution and to the Institution of Mining Engineers.

Synthetic Mica

AN inorganic insulating composition with mica-like characteristics known as "Alsifilm," which has been developed by Dr. E. A. Hamer and Dr. (Miss) D. S. Le Beau, of Massachusetts Institute of Technology, is described in the *Electrical World*. Its basis is Bentonite, a colloidal clay containing aluminium silicate or magnesium silicate and plentiful in the Western United States. A gel of Bentonite and water hardens gradually at room temperatures. Spread in thin films and heated, the resulting coherent self-supporting sheets are said to be non-inflammable at 700 deg. C., to be resistant to oils and organic solvents and to have, when dry, a breakdown strength of 3,000 V per mil. Waterproof qualities can be added by drying the gel in films by infra-red light and treating with lead acetate. The films can be produced to any degree of flexibility in thicknesses of from 0.001 to 0.005 in. thick and in almost any length or width. They are normally translucent, but may be dyed any colour while in the gel state

NEW ELECTRICAL PRODUCTS

A Review of Equipment Recently Marketed

Electro-Steam Cooking Range

THE Gillott electro-steam cooking range produced by GILLOTT AMBERTON THERMICS, LTD., 32, Queen Victoria Street, London, E.C.4, provides not only for roasting, baking, grilling, boiling and steaming (with live steam) but also for water heating, water boiling and a separate supply to the bath—in fact, all the cooking and water heating requirements of the home on one appliance. It is extremely compact and by incorporating all the services in one unit it obviously saves a good deal of labour in operation and effects economy in the use of electricity.

The facility of obtaining boiling water at short notice for tea making, &c., is a valuable feature, since not only is it claimed to be quicker than an electric kettle or a boiling plate (approximately four pints every three to four minutes if required), but also the saving in maintenance is appreciable. Hot water for culinary or other purposes is always available at about 180 deg. F., this temperature being automatically maintained by a thermostat. When bath water is required a circulator valve is opened, permitting hot water to circulate to the domestic hot water tank.

Gillott electro-steam cooker with (left) the boiler as a separate unit

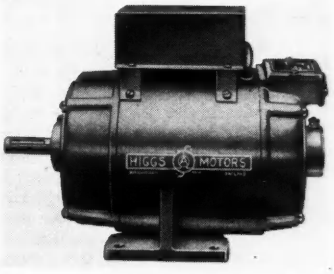
The oven is thermostatically controlled and, in addition to a radiant-type boiling plate (2,000 W), there is a solid simmering plate (1,800 W) so designed that the heat is evenly distributed over its surface. Steel and cast-iron are employed throughout the cooker, the body being built upon a chassis to ensure rigidity and strength. The finish is vitreous enamel, chromium plated or rendered corrosion proof. The steam-producing tank and drip tray are of "Monel" metal. Thus constructed, with no corners or crevices to hold dirt, cleaning presents no difficulty.

Combining as it does the facilities of an electric cooker, kettle, steamer, hotcupboard and sink and bath water heaters, the apparatus, besides having an initial cost less than that of the total of the separate items, is cheaper and easier to install. In bungalows or flats the boiler makes the usual hot water system and coke or other boiler unnecessary, while in the café, small hotel or boarding house the facility of having steam and boiling water in this unit is of great value. In first-aid stations, hospital ward kitchens or farms, the service would be much appreciated. While the standard appliance (with a total loading of 11.8 kW) is nominally for domestic purposes, larger sizes can be made to meet any requirements. If desired, the electro-steam boiler can be supplied as a separate unit.

Fractional-HP Motors

Small single-phase motors for industrial and domestic purposes can usually be classified as split phase; split phase, capacitor start; or repulsion start. Generally the essential differences between these three types of motors is the relative values of their starting torque and current, while an inherent fault of single-phase motors is the relatively poor starting torque and higher starting current as compared with three-phase motors.

A fourth type of machine, however, has now been put on the market by HIGGS MOTORS, LTD., Birmingham, which combines the simplicity and reliability of the split-phase motor with the performance of the repulsion start machine. This type of motor, known as the "ETH" type, is made in sizes up to 2 HP, 2,800 RPM. It is a split-phase motor but has a new type of patented rotor which, when used in conjunction with a condenser, gives an exceptional performance.



Higgs fractional-HP single-phase motor

These machines are made in two types—capacitor start for applications where the maximum pull-in torque is not required, and capacitor start and run where maximum pull-in torque, combined with quiet running and low starting current, are essentials. The latter type is said to compare very favourably with the normal repulsion start induction motor, while the former has a performance better than the normal capacitor start machine.

Both types have an approximate starting torque of 250/350 per cent. of full-load torque, and an important feature is the high torque which is maintained during the whole of the accelerating period and particularly the pull-in torque, which is the minimum torque exerted by the motor at the time when the centrifugal switch comes into operation. This, in the capacitor start type, is 170/225 per cent. of full-load torque, and in the capacitor start and run type 200/300 per cent. of full-load torque. This is at least as good as the majority of repulsion start motors.

Dry Accumulator

A dry unspillable accumulator for torches, cycle and hand lamps is the latest product of GRAHAM FARISH, LTD., Bromley, Kent. It is constructed with pasted lead plates, the negative of which also forms the outer container, while the positive is hollow and carries a cap for the admission of acid, distilled water, &c., and to permit gassing while on charge. The cell is supplied to the dealer in a charged condition, and will light a 2.5-V, 0.2-A bulb for 20 minutes daily for a fortnight. Recharging takes 12 hours at ¼ A, but if speed of recharging is important the time can occasionally be reduced to 8 hours by increasing the charge to ½ A. The accumulator measures 2½ in. high by 1¼ in. in diameter and weighs only 4 oz. A series of cells make efficient high-tension accumulators for radio or laboratory use.

Graham Farish dry accumulator

Street Lighting Unit

In our last week's issue, page 137, we mentioned that the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2, had introduced a 15-W street lighting unit for 10-ft. nominal mounting height. We illustrate herewith one of these fittings mounted in a double conical side-street lighting reflector.

G.E.C. 15-W street lighting unit

Penetrating Oils

The new "Slip" penetrating mineral compound oil made by the RAWLPLUG CO., LTD., Cromwell Road, London, S.W.7, can be used not only for rust removing and cleaning, but also for the lubrication of bearings, shafts, machine tools, pneumatic hammers, dynamos and motors and, in fact, light machinery of all types. The oil, which is made in both light and dark (graphite) types, is a blend of rust-freeing compounds with remarkable creeping properties. It is free from acid.

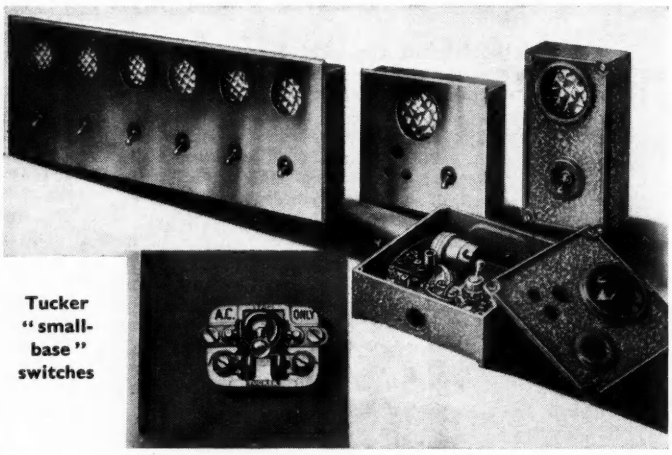
Small-base Switches

In the note on page 74 of our January 19th issue relating to a new range of installation accessories made by J. H. TUCKER & CO., LTD., we included an illustration which we described as a "small-base" switch. The manufacturers point out that this is actually a 7-A skeleton switch, which, though having dimensions for use in restricted space, is not what is generally understood as the company's "small-base" switch. Actually this is an AC flush type unit as illustrated in the multi-section unit. Further illustrations of these switches are reproduced herewith.

Electrical Slide Rule

The "P.I.C." AC electrical slide rule made by A. G. THORNTON, LTD., Paragon Works, King Street West, Manchester, introduces a new system of trigonometrical and other scales especially designed for electrical calculations. It is particularly suited to all calculations involving vector quantities, and to AC problems. Among its special features are a scale by means of which the square root of the sum of the squares of two numbers is readily determined without the need for actually determining the squares or their sum; trigonometrical scales arranged so that with a single setting of the cursor, given θ, sin θ, cos θ, or tan θ, the other three can be read off at once, the angle scale being easily read to 0.05 deg., i.e., three minutes, at all points; and temperature-resistance scales for copper given in a new form. In addition to the normal log. log. scale ranging from 1.1 to 100,000, a decimal log. log. scale is given which is claimed to be of great value in decay, attenuation and kindred problems.

Another new product of the company is an adjustable set-square, which simultaneously furnishes sine, cosine, tangent and angle readings for a particular setting, so obviating the need for an inverse reading of trigonometrical tables when positioning the instrument to comply with the normally provided linear data.



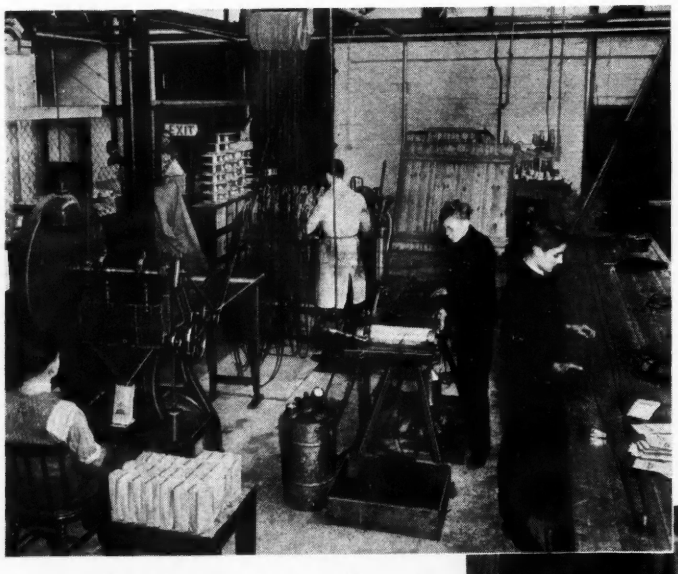
Tucker "small-base" switches

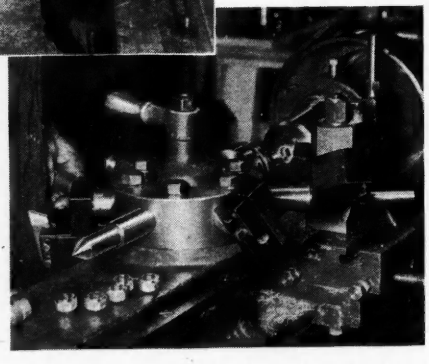
Metal Water Jet Pumps

Until recently metal water jet pumps have come mainly from abroad. Now, however, W. EDWARDS & CO., Allendale Works, Southwell Road, Loughborough Junction, London, S.E.5, have developed a unit which is stated to have a performance superior to that of any of the models hitherto supplied by them. It has the lowest possible vacuum, 12 mm. Hg., and a high speed at a water pressure of only 15 lb. per sq. in. Rubber or screw connections are provided and the whole assembly is unbreakable and easily cleaned.

Rubber Binding Sleeves

RUBBER sleeves are rapidly achieving popularity as a neat, convenient, rapid and efficient method of binding, insulating and marking electrical conductors. A few days ago at the factory of Hellermann Electric, Ltd., Goodtric Works, Purley Way, Croydon, where a quarter of a million of these sleeves are now being made every day, Mr. J. Bowthorpe, the managing director, gave us an opportunity of seeing how they, and also the special tools required, are made.





Making rubber binding sleeves at the works of Hellermann Electric, Ltd., and (right) machining a cone type cable lug

The sleeves are produced under a patented process from seamless tubes made from a special rubber mixture, which has a high resistance to oil and heat, is hot-vulcanised and treated to prevent ageing. This tube arrives at the factory in hanks and the first process is to cut it by hand into lengths of about 33 ft. Glycerine is then introduced under pressure to lubricate the inside and make the sleeves slip easily on to the conductors, the surplus liquid being removed by passing the tube through a machine similar to a domestic electric wringer.

Thus treated, the tube is wound on spools, which are mounted 25 at a time at one end of the cutting machine. A system of pulleys takes off the tension as the tubes are fed into the semi-automatic guillotine which cuts them to the desired length and counts them as they are dropped into bags beneath. The machine is capable of turning out a million sleeves a day and it is probable that this capacity will be reached before long as the company is already planning an extension of the factory. In addition to the standard sleeves, which are available numbered and lettered and in a range of seven colours, various specially shaped types are produced.

The tools required for fitting the sleeves are made in a separate section of the works by an associated company, the Bowthorpe Engineering Co. These tools take the form of special pliers with three mandrels, which when in service spread out in such a way that the three points form as it were an equilateral triangle. The rubber sleeves are placed over the mandrels before opening and are then expanded so that they can easily be fitted to the end of the conductor.

In addition to the abovementioned articles a further range of products made by the controlling company, the Bowthorpe Electric Co., Ltd., is manufactured in the same works. These are the well-known "Goodtric" overhead line accessories which include linesmen's tools, line taps and clamps, wire rope clips, &c., several new types of which have recently been placed on the market.

ARGENTINE ELECTRICAL IMPORTS

German Share in 1938

THE imports of electrical goods into Argentina in 1938 declined slightly in value, although quantitatively the drop was less than the values indicate. After a rise of nearly 30 per cent. between 1936 and 1937 the reaction was not surprising, and present prospects are considered good. The accompanying statement showing the principal groups of imports and supplying countries is based on the recently-issued annual statement of the foreign trade of the Republic.

The values, which are in paper pesos at 17 to the £, are in accordance with the official valuations of the Argentine Customs Department.

It will be seen that a large number of countries compete for the business. Consequently considerable rivalry may be expected for the large proportion of the trade which Germany used to gain. No very striking changes are noticeable in the origin of the imports. The United Kingdom maintained her position in wire and cables, except lead-covered over 5 mm. and telephone cables. Local manufacture of dry batteries seems to be affecting imports. From Argentine factories there is competition also in domestic appliances at low prices, but there is still a good sale for imported articles, and the same remark applies to radio parts, wires and cables. There is local assembly of house service meters and refrigerators.

During a recent visit to this country Major W. A. McCallum, C.B.E., chairman of the British Chamber of Commerce in the Argentine Republic, stressed the fact that Argentina was a most important market for Great Britain. There were several factors operating in our favour such as the depreciation of sterling; the availability of exchange for all imports from the United Kingdom; and the elimination of Germany as a competitor. Rumours were spread a short time ago that British manufacturers were unable to "deliver the goods" but steps have been taken to counteract the impression thus given.

In an article contributed to the ELECTRICAL REVIEW a few months ago (July 28th, 1939) Mr. H. C. Siddeley urged British electrical manufacturers to make a complete study of the market with a view to setting up a selling organisation. He instanced radio, accumulators, conduit, cables and electrical machinery as branches in which there appeared to be scope for improved British trade.

	1938 Pesos (000)	Inc. or dec. on 1937 Pesos (000)
Fan motors—		
Total	300	− 57
From Germany	50	− 4
„ Japan	10	− 52
„ United States	141	− 15
„ Italy	70	− 13
„ United Kingdom	28	− 4
Motors, up to ¼ h.p.—		
Total	303	− 27
From Germany	21	− 3
„ United States	230	− 2
„ Italy	4	− 2
„ United Kingdom	44	− 18
Motors and dynamos, over ¼ h.p.—		
Total	3,377	+ 187
From Germany	1,265	+ 70
„ United States	303	− 71
„ Denmark	163	+ 17
„ Italy	250	+ 73
„ Holland	100	− 6
„ United Kingdom	486	− 83
„ Sweden	435	+ 60
„ Switzerland	282	+ 170
Cable and wire, up to 5 mm., covered with cotton, rubber, etc.—		
Total	2,165	+ 610
From Germany	388	+ 78
„ United States	69	− 96
„ United Kingdom	1,088	+ 338
„ Canada	6	− 7
„ Belgium	230	+ 102
Cable and wire, over 5 mm., covered with cotton, rubber, etc.—		
Total	616	+ 66
From Germany	88	− 40
„ United States	31	− 26
„ United Kingdom	366	+ 88
Cable and wire, up to 5 mm., lead-covered—		
Total	408	+ 128
From Germany	86	+ 28
„ United Kingdom	231	+ 68
„ Sweden	40	− 13
Cable and wire, over 5 mm., lead-covered—		
Total	2,423	− 607
From Germany	60	− 60
„ Belgium	65	+ 15
„ United Kingdom	1,490	− 1,250
„ France	400	+ 394
Wire, electrical, enamelled—		
Total	376	− 29
From Germany	186	+ 95
„ United States	64	− 118
„ United Kingdom	80	− 24
Cable and wire, silk-covered—		
Total	43	+ 9
From Germany	1	− 9
„ United States	10	+ 6
„ United Kingdom	14	+ 5
Telephone cable, underground—		
Total	8,430	+ 1,480
From Germany	1,590	− 1,380
„ Italy	2,170	+ 630
„ Holland	42	− 130
„ United Kingdom	358	− 297
„ Sweden	574	+ 134
„ Belgium	3,160	+ 2,240
Telephone cables of iron or steel—		
Total	384	− 186
From United States	346	− 215
Accessories for underground cables—		
Total	137	− 28
From Germany	78	− 45
„ Italy	35	+ 19
Insulating tape—		
Total	175	− 95
From Germany	31	− 39
„ United States	82	− 3
„ United Kingdom	47	− 10
„ Japan	5	− 10
Flex—		
Total	1,240	+ 615
From Germany	68	+ 15
„ Belgium	56	+ 10
„ United States	90	+ 13
„ United Kingdom	955	+ 580
Parts for accumulators and batteries—		
Total	1,336	− 427
From Germany	278	− 29
„ United States	800	− 267
„ United Kingdom	105	− 43
„ Canada	52	− 40
„ Belgium	23	+ 1
Accumulators for motor vehicles—		
Total	148	− 8
From Germany	29	+ 2
„ United States	84	− 42
Other accumulators—		
Total	36	− 51
From United Kingdom	36	+ 23
Batteries—		
Total	1,260	− 540
From Germany	2	− 1
„ United States	1,057	− 579
„ United Kingdom	126	+ 56
„ Denmark	87	− 11
Ammeters and voltmeters—		
Total	162	− 16
From Germany	72	− 18
„ United States	51	− 4
„ United Kingdom	28	+ 6
Radio-telephone apparatus—		
Total	927	− 83
From Germany	176	+ 146
„ United States	406	− 149
„ Holland	254	− 86
„ United Kingdom	70	− 5
Receiving valves—		
Total	3,170	− 1,170
From Germany	15	− 4
„ United States	2,250	− 1,050
„ Hungary	275	+ 70
„ Holland	600	− 196
„ United Kingdom	22	+ 5
Amplifier valves—		
Total	165	+ 32
From United States	134	+ 17
Loudspeakers (metal)—		
Total	729	+ 14
From United States	654	+ 12
Radio-telephone parts—		
Total	3,182	− 228
From Germany	224	− 466
„ United Kingdom	160	—
„ United States	2,254	+ 150
„ Holland	310	− 70
Telephones—		
Total	853	− 72
From Sweden	48	− 2
„ United Kingdom	11	− 2
„ Germany	90	− 10
„ Belgium	697	− 9
Telephone material—		
Total	928	+ 94
From Germany	29	+ 7
„ Belgium	346	+ 94
„ United States	175	+ 47
„ United Kingdom	214	− 19
„ Canada	130	− 10
Electric bells—		
Total	131	− 2
From Germany	46	− 3
„ Belgium	5	− 3
„ Italy	72	− 1
„ United Kingdom	2	− 1
House-service meters—		
Total	1,400	− 1,820
From Germany	467	− 1,450
„ Denmark	52	− 38
„ United States	68	+ 11
„ United Kingdom	26	− 16
„ Switzerland	330	− 300
„ Sweden	127	− 184
Electric incandescent lamps—		
Total	1,780	− 140
From Germany	68	− 37
„ Belgium	184	− 51
„ United States	120	− 20
„ Japan	728	− 152
„ Holland	156	+ 39
„ United Kingdom	207	+ 39
Switches, circuit-breakers, cut-outs, fuses, etc.—		
Total	1,445	− 65
From Germany	1,010	+ 100
„ United States	139	− 75
„ United Kingdom	122	+ 2
„ Italy	70	− 35
„ Belgium	62	− 38
Distribution boards—		
Total	254	+ 44
From Germany	93	+ 44
„ United States	8	+ 7
„ United Kingdom	62	− 31
Change-over switches—		
Total	1,336	+ 536
From United States	2	− 27
„ United Kingdom	1,017	+ 400
„ Belgium	163	+ 75
Heaters, toasters, kettles, etc.—		
Total	207	− 3
From Germany	157	+ 7
„ United States	29	− 9
„ United Kingdom	10	+ 5
Vacuum cleaners—		
Total	270	+ 40
From Germany	30	− 1
„ United States	10	− 15
„ Sweden	180	+ 22
„ United Kingdom	9	+ 7
Electric irons—		
Total	133	− 257
From Germany	57	− 154
„ United States	63	− 79
Insulating tubes—		
Total	1,180	− 370
From Germany	774	− 386
„ United States	78	− 26
„ United Kingdom	300	+ 80
Electrical materials, unspecified—		
Total	3,420	+ 156
From Germany	1,460	+ 160
„ United States	794	− 116
„ France	94	+ 49
„ Italy	43	—
„ United Kingdom	400	+ 120
„ Sweden	30	− 6
„ Switzerland	173	+ 45
„ Canada	48	+ 1

Diesel Engine Manufacturers' Progress

JOHN FOWLER & Co. (Leeds), Ltd., have published a well produced brochure with the title "Achievement," following the publication two years ago of a book under the title of "Revolution" to show how they had revolutionised their manufacturing methods and put down modern plant for the production of the Fowler-Sanders Diesel engines. The purpose of this new book is to show the success of that policy. It epitomises in pictorial form the large amount of internal combustion engine work carried out by Fowlers in all parts of the world in the past two years.

COMMERCIAL and INDUSTRIAL NEWS

Export Trade Council. Electricity in Agricultural Colleges. A.R.P. Lighting Exhibition. Oil Engine Acquisition. Domestic Appliance Sales in America

Developing Britain's Export Trade

THE Board of Trade last week set up an Export Council to assist in the organisation of the country's export effort. Sir Andrew Duncan, President of the Board of Trade, will be chairman of the Council, and Mr. R. S. Hudson, secretary of the Department of Overseas Trade, will be vice-chairman. The members include, Mr. S. R. Beale, chairman and managing director of Guest, Keen & Nettlefolds, Ltd., and a director of Mavor & Coulson, Ltd., and Mr. John Brown, general secretary of the Iron and Steel Trades Federation.

Mr. Hudson stated in the House of Commons on January 18th that he had appointed a Committee for the purpose of establishing closer contact with the exporting industries, and as a channel for the investigation of difficulties and the encouragement of effort in the export trade. The Committee is as follows:—Mr. E. Raymond Streat, C.B.E. (chairman), director and secretary of the Manchester Chamber of Commerce; Mr. R. B. Dunwoody, C.B.E., secretary of the Association of British Chambers of Commerce; Mr. C. F. I. Ramsden and Mr. R. Glenday, M.C., of the Federation of British Industries; Lt.-Col. V. I. Robins, O.B.E., A.C.A., secretary of the National Union of Manufacturers; Mr. C. C. Orme, of the London Chamber of Commerce; and the secretaries of the Chambers of Commerce at Birmingham, Bradford, Glasgow, Leicester and Sheffield.

Telling Publicity

The General Electric Co., Ltd., is carrying out a new advertising campaign for its industrial fittings in a group of thirty-five trade publications. This scheme is aimed at maintaining the company's name in the minds of executives of the marine, hospital, and general industrial markets during the war. Four different forms of layout tell how the planning of lighting entails the selection of correct fittings for the particular purpose, and how their utilisation in a scientific manner increases efficiency, safety and comfort. The advertisements themselves are straightforward in design, with legible typography and illustrated by clean scraper board drawings. "Consult the G.E.C.—Manufacturers of Lighting Fittings for all Requirements" is the appropriate slogan which is used throughout the campaign.

The company has recently arranged two new attractive displays in its show-windows at Magnet House, Kingsway, London, W.C.2. The accompanying picture shows the "Osram" lamp display incorporating the slogan, "Light up and Smile for a Brighter 1940." Behind the pelmet is mounted a shop-window fitting, complying with the official regulations, and

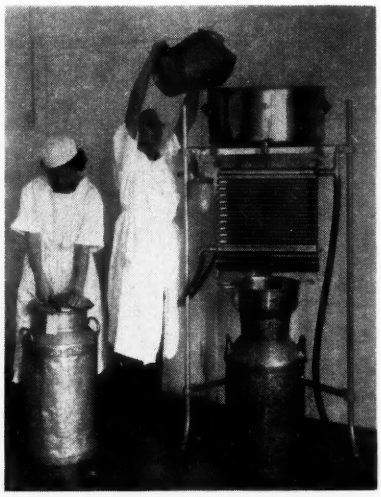
An Osram lamp window display at the G.E.C. headquarters at Magnet House, Kingsway, W.C.2

arranged so as to illuminate the centre part of the display during the black-out. A selection of lighting fittings is also shown. The other display shows an up-to-date range of radio receivers backed by the message, "There's always a G.E.C. Radio to Cheer You!" Built into the centre is a display cabinet containing a BC.4050 receiver which is illuminated after dark in accordance with A.R.P. requirements.

Electricity in Agricultural Colleges

A work of national importance is being carried out at the various agricultural colleges in England, and some of them are now accommodating members of the women's land army. The advantages of electricity have not been overlooked, and Callender's Cable & Construction Co., Ltd., have sent the following details of such institutions where their cable has been installed.

The school of agriculture for the County of Durham includes a farm of 350 acres. The electrical contractors were F. Reid Ferens & Co., who installed 500 lights, a power supply for the electric demonstration kitchen and for the boiler mechanical stokers, electric clocks, and internal telephone system. In the poultry section there is an electric cabinet incubator for 2,600 eggs, and also brooders and hovers. The Callender cable supplied amounted to 15,000 yd., for 600 V and 250 V.



Students cooling milk and labelling churns at the Somerset Farm Institute

Somerset has a very fine farm institute near Bridgwater. Opened in 1921, it was recently improved, the electrical work being carried out by Mr. L. A. Evans, of Weston-super-Mare, with Callender cable. The wiring included the piggeries, dairy, poultry farms and offices. Here the whole facilities were taken over for the women's land army. The farm of 200 acres includes 65 acres of arable and three of orchards, a special feature being the National Institute of Agricultural Botany Crop Testing Station. The importance of electricity in agricultural work in general is recognised, and poultry section students are specially instructed in its uses. There is a 1,000 egg electric cabinet incubator and six different types of electric brooders.

The East Malling Research Station now includes the mansion and 200-acre estate of Bradbourne House, adjoining. The extensive electrical installation for the mansion and other buildings has been carried out by Mr. H. T. Barden, of Maidstone, using Callender cables throughout. Previously he had used the company's cable exclusively for wiring the research station itself.

The "Electrical Review" Index

The index to Vol. CXXV of the ELECTRICAL REVIEW (July-December, 1939) is now available. Any reader who requires a copy may obtain one gratis from the Publisher, ELECTRICAL REVIEW, Dorset House, Stamford Street, London, S.E.1. Cloth binding cases may also be obtained at 3s. 6d. each (3s. 10d. post free).

L.P.T.B. Workers' Wage Increase

An agreement for a wage increase was signed on February 1st between the London Passenger Transport Board, the London Transport Joint Trades Committee, and the N.U.R. It covers the Board's railways, omnibuses, tramcars and engineering shop staffs. Men will receive a war wage increase of 1d. an hour and women ½d. an hour. For workers from 18 to 21 the increases are:—Youths, ¼d. an hour; girls ½d. an hour. Under the age of 18 the increase is ¾d. an hour for both boys and girls. The dates of the increases are:—Omnibus service from January 10th; tramcar service from January 11th; and railways from January 15th.

"Sirius" Shilling Lamps

E. K. Cole, Ltd., announce a full series of "shilling" lamps to sell under the name of "Sirius." These are intended for the domestic low-price market, and are additional to the "Ekco" ranges already on the market. The "Sirius" terms for re-sellers are similar to those for "Ekco" lamps, and carry a generous basic discount, with opportunities of gaining additional bonuses and rebates according to turnover. Twelve lamps are included in the "Sirius" range, six clear and six pearl. The types available are of 15, 25, 40 and 60 W at 1s., with 75 and 100 W at 1s. 6d., all suitable for 110 V and 200/250 V. A distinctive carton design has been prepared.

Employment in December

The number of unemployed in the engineering industry at December 11th showed a further decrease on the whole, according to the *Ministry of Labour Gazette*, employment improving

in most sections, including electrical engineering.. The percentage unemployed among insured persons in the engineering industry was 3.2, as compared with 3.4 per cent. at November 13th (7.8 per cent. at December 12th, 1938). The number out of work in the electrical engineering industry was 2,935, the percentage falling by 0.2 to 2.4 as compared with November, and by 2.5 per cent. as compared with December, 1938. In the electrical wiring and contracting industry there were 3,178 unemployed, or 7.4 per cent., as compared with 7.9 per cent. in the previous month and 9.7 per cent. in December, 1938. The number out of work in the electric cable, apparatus, lamps, &c., group totalled 8,667 or 4.7 per cent. (5.1 per cent. in November and 6.8 per cent. in December, 1938).

For the whole of 1939 most branches of the engineering industry showed a considerable improvement, the average percentage rate of unemployment being 5.4, as compared with 7.4 per cent. for 1938. The average percentage rate in electrical engineering was 3.7 (against 5.1 per cent.).

Internally-Frosted Lamp Patent

The action brought by the British Thomson-Houston Co., Ltd., against Tungstalite, Ltd., alleging infringement of its Letters Patent No. 228907 (to which we referred in our last issue), has been occupying the attention of Mr. Justice Bennett in the Chancery Division for the past few days and is still proceeding. After hearing a part of the evidence His Lordship paid a visit to the defendant's works and saw a number of experiments carried out. The patent concerns a process for the internal frosting of electric lamp bulbs.

Principles of Good Lighting

The illustrated brochure of 64 pages entitled "Lighting for Vision," which has been produced by the Benjamin Electric, Ltd., may be regarded either as an elementary textbook on the subject or as a model of the way in which the advantages of adequate illumination should be explained to the factory manager. Particularly convincing in the latter connection are the photographs of 120 machine or bench operations, in alphabetical order, as they appear when the working plane is illuminated by the range of foot-candles given in each instance, it being assumed, of course, that suitable reflectors are used. Data are given in support of the statement that good lighting improves output and reduces the number of accidents, while due prominence is afforded to the important aspect of cleaning and maintenance. The brief summary of the requirements of the Factories Act, 1937, should also be useful.

A.R.P. Lighting Exhibition

Answers to the innumerable problems relating to the black-out at home, at work and in the streets are to be found at an exhibition now being held at the Building Centre, New Bond Street, organised by the British Electrical Development Association in conjunction with the E.L.M.A. Lighting Service Bureau. Besides demonstrating the wide range of standard appliances now available for A.R.P. purposes, the exhibition draws public attention to one big mistake that has been made almost universally, namely, the "inside black-out." It is emphasised that it is quite easy to cover up windows and at the same time have brightness and light within, experts having produced the necessary apparatus.

Benjamin reflectors lighting the trade section of the Postal Censorship Headquarters

Among the methods of blacking out are to be seen blast-proof shutters and blinds of various types from ordinary wall board to huge equipments on the Venetian blind principle covering the roof of the largest factory. Electric fans solve the problem of shelter ventilation, while it is demonstrated how emergency lighting equipment obviates the danger of the lighting in shelters failing. In addition to photographs of up-to-date industrial lighting, which can be utilised without modification if the black-out arrangements are efficient, there are examples of lamps for docks, railway yards, &c.

A special display of window signs shows shopkeepers how bright they can make their windows and at the same time comply with Home Office and Police Regulations. The use of fluorescent lighting is also demonstrated, and among many other interesting exhibits are the authorised car lamps and masks, black-out curtain rods, a gas mask with telephone receiver and transmitter, electric heaters and small cookers for wardens' posts, a clothes dryer and illuminated walking sticks.

Declaring the exhibition open, Sir John Anderson, the Minister for Home Security, said that the ideal black-out would be no lights at all, but that would mean no production,

A corner of the A.R.P. Lighting Exhibition now being held at the Building Centre, New Bond Street, W.1

almost no life, after dark. The object should be, therefore, to have such obscured or controlled light as would enable essential activities to be carried on, but at the same time show no light to aircraft. People should make as much use as possible of the relaxations allowed, and advantage should be taken of the ingenious new devices which were available. To mark the occasion Sir John was presented with one of Berry's Electric's illuminated walking sticks.

The following are among those taking part in the exhibition: Lighting: E.L.M.A. Lighting Service Bureau; J. Akers, Ltd.; Joseph Lucas, Ltd.; and Trico-Folberth, Ltd.; F. C. Heayberd & Co., Ltd.; Revo Electric Co., Ltd.; Linolite, Ltd.; Partridge, Wilson & Co., Ltd.; B. J. Legg (Industries), Ltd.; and W. Andrew Bryce & Co., Ltd. Heating: General Electric Co., Ltd.; Unity Heating, Ltd.; E. K. Cole, Ltd.; H.M.V. Household Appliances; and Hotpoint Electric Appliance Co., Ltd. Pumping: James Beresford & Son, Ltd.; and the General Electric Co. Ltd. Telephones: G.P.O.; Phœnix Telephone & Electric Works, Ltd.; and Airguard, Ltd. Blast Protection: Henry Hope & Sons, Ltd.; C. F. Anderson & Son, Ltd.; Hills Patent Glazing Co., Ltd.; Crittall Manufacturing Co.; and Bennie Lifts, Ltd. Ventilation: Cellactite & British Uralite, Ltd.; Richard Crittall & Co., Ltd.; Vent-Axia, Ltd.; Tidmarsh & Sons; and Crittall Manufacturing Co. The Home Office A.R.P. Technical Department is also co-operating in the display.

Lighting at Postal Censorship Headquarters

The postal censorship headquarters handles daily a large amount of correspondence and other matter which requires careful examination, and good lighting is therefore essential. For this purpose Benjamin "Saaflux Glassteel" diffusers are used, providing good illumination with an absence of shadow. Lighting is used even in the daytime to ensure less variation in different parts of the room.

Engineers' Wages

Following negotiations between engineering employers and the unions of the men in the industry on February 6th, it was officially announced that all the parties—the Employers' Federation, the executive of the A.E.U., and the executive of the Confederation of Shipbuilding Trades—would recommend to their constituent bodies the following terms:—(1) that the national bonus be increased by 5s. a week to all adult male workers, such increase to apply as from the commencement of the pay period starting in the week beginning February 19th, 1940. (2) The wages of apprentices, boys and youths will fluctuate proportionately according to the national agreement of December, 1937.

Emergency Addresses

Since the outbreak of hostilities we have received many inquiries for the emergency addresses of electrical concerns, and while a large number of companies have notified us of their removal, there have been occasions when we have been unable to supply the information. The publication, therefore, by Emergency Services (Cresco, Ltd.), 76, Chancery Lane, London, W.C.2, of the "Emergency Addresses Directory" (price 1s.), will serve a useful purpose. The publishers do not claim that the directory is complete, but in its fifty or so pages they have collected a comprehensive classified directory of business houses, &c., which are now operating from emergency premises. All classes of trades and

professions are included, and under the classified heading of "Commercial and Industrial," a number of electrical and allied companies will be found.

Oil Engine Acquisition

Ruston & Hornsby, Ltd., have acquired the whole of the share capital of Davey Paxman & Co. (Colchester), Ltd., oil engine builders and boiler manufacturers. The business will be continued as heretofore, under the managing directorship of Mr. E. P. Paxman. The products of the two companies are complementary and the objective is to enlarge the joint range of manufactures to the mutual advantage of both businesses in meeting post-war conditions and in consolidating their position in world markets.

"Philora" sodium lighting at the works of the Lancashire Steel Corporation, Ltd.

Trade Announcements

"Volspray," Ltd., has purchased the assets, including stock, goodwill, patents and registered designs, of Kurt Erlach, Ltd. (in compulsory liquidation), and will manufacture paint spraying equipment of all types and particularly the "Volspray" air volume type spraying machine. The machines will be manufactured at the new works at Tidal Basin Road, London, E.16. The original staff of Kurt Erlach, Ltd., have been taken into the employment of "Volspray," Ltd.

The Thames Bank Lift & Electrical Co., Ltd., 135, Upper Thames Street, London, E.C.4 (lift installations, repair and maintenance, machinery installation and maintenance, electrical work), has now started in active business and asks for manufacturers' catalogues.

Equipment for Palestine

A firm of agents and representatives in Palestine ask to be put into touch with British manufacturers of a variety of electrical products including rubber wire, lead-covered cables, lamps, bakelite accessories, plastic material, wall brackets, irons and radio sets. They state that they are ready to place a substantial order for rubber-covered wire if prices are reasonable. We shall be pleased to pass on any communications from interested firms.

New L.M.S. Rolling Stock

With reference to the description of the new L.M.S. rolling stock in our last issue, Bull Motors inform us that the 600-V motors for driving the two-cylinder air compressors were all manufactured by them.

Price Increase

The Warm-Glow Co. announces that owing to the general rise in the prices of raw materials it has increased its pre-war list prices of electric blankets by one-third.

American Domestic Appliance Sales

The January issue of *Electrical Merchandising* (New York) contains a review of the sales of domestic electrical appliances in the United States during the past ten years. It is shown that in 1930 the leading item was radio receivers; 3,827,800 valued at $332,198,000 were sold. Figures were not available for 1939, but in 1938 5,823,000 sets (value not given) were disposed of. The number of lamps sold in 1930 was 575,163,000, and their value was $142,545,000; the corresponding totals for 1939 were 970,000,000 and $150,000,000, indicating a substantial reduction in the unit price. The sales of other items are shown in the following table:—

Appliances	1930 No.	1930 Value, $	1939 No.	1939 Value, $
Refrigerators	791,000	217,525,000	1,840,000	309,120,000
Washing machines ...	802,000	83,809,000	1,320,000	90,090,000
Vacuum cleaners ...	1,170,339	55,987,704	1,409,500	66,326,550
Ranges	180,000	27,000,000	340,000	49,980,000
Fans	916,000	15,474,000	1,148,190	12,974,435
Clocks	1,400,000	15,155,000	3,220,000	16,000,000
Irons	2,362,500	10,867,500	3,428,500	15,010,500
Toasters	1,263,000	6,946,500	2,166,375	14,861,200
Radiators	242,400	1,151,440	400,600	1,674,500
Cookers and casseroles	145,000	985,000	30,000	150,000

Another interesting section shows the "saturation," or "acceptance" as our contemporary prefers to say, figures for the various appliances. First in order comes the iron, which is in use in 95 per cent. of American homes. Then follow washers 59.6 per cent., refrigerators 56 per cent., toasters 55.5 per cent., cleaners 48.4 per cent., clocks 49.1 per cent., percolators 32.5 per cent., waffle irons 23.2 per cent., heating pads 20.5 per cent., heaters and radiators 20.2 per cent., hot plates 17.3 per cent., ranges 10.3 per cent., and ironers 6.3 per cent.

Sodium Lighting in a Steel Works

During the last few years sodium electric-discharge lighting has been installed extensively for industrial lighting of various types. A typical installation is that at the plant of the Lancashire Steel Corporation, Ltd., where one of the first installations of sodium lighting was placed in the main foundry. Although the energy consumption of the sodium scheme is 60 per cent. lower than that of the system used previously, the light intensity has been raised from a maximum of one ft.-candle to a uniform level of five ft.-candles. Experience having proved the worth of sodium lighting in the main foundry, the system has since been extended to many other departments. The accompanying picture shows the cogging mill electrical drive, where the complete power house is illuminated by six 140 W sodium lamps with satisfactory results. Philips "Philora" sodium lamps and control gear are used throughout, and were supplied by the Manchester branch of Philips Lamps, Ltd.

Tunisian Export Prohibitions

According to recent issues of the *Journal Officiel Tunisien*, Orders dated November 17th and December 6th prohibit the export from Tunis of electrodes for electric furnaces, electrolysis, batteries, or other uses to countries other than France and Algeria, except under licence.

Calendar

The Spencer Wire Co., Ltd., has sent us a calendar with large daily slips each of which bears a quotation.

Prices of Materials

Henry Gardner & Co., Ltd., report, February 7th: No change in the prices of copper bars (best selected), sheet and rod, English pig lead and spelter. Mercury, $207, $7 increase. English block tin, £236 15s., £1 15s. decrease.

No change in the prices of materials was reported on February 7th by Edward Till & Co. (india-rubber, Para fine), and F. Smith & Co. (electrolytic copper bars, wire rods and h.c. wire).

New Catalogues and Lists

Metropolitan Electric Supplies, Metway Works, 2, Marshalls Row, Brighton.—A folder of "Metway" heating elements and spirals.

Harland Engineering Co., Ltd., B.E.P. Works, Alloa, Scotland.—Publications relating to "Spiroglade" multi-stage horizontal pumps (X.60a), borehole and deep well pumps (X.63b), large DC motors (X.109), "Duoglade" two-stage horizontal pumps (X.65a) and trailer fire pumps (X.123).

Crypton Equipment, Ltd., North Acton Road, Park Royal, London, N.W.10.—Catalogue CR10 dealing with metal and valve rectifiers. Also a leaflet describing a low-priced battery charger for cars.

Bowthorpe Electric Co., Ltd., Goodtric Works, Purley Way, Croydon.—"Up the Pole" leaflets Nos. 1A, 3A and 7, giving particulars of "Goodtric" line taps and wire rope clips.

Higgs Motors, Ltd., Birmingham.—Catalogue Section 9, page 1, on type "ETH" high-torque fractional-HP, single-phase, capacitor start and run motors.

British Insulated Cables, Ltd., Prescot, Lancs.—A 48-page, stiff-backed catalogue (N.C.3.L) of miscellaneous materials for overhead lines.

Belling Electric Co., Ltd., Bridge Works, Southbury Road, Enfield.—A poster indicating some of the uses of the new "Champion" heaters.

British Thomson-Houston Co., Ltd., Crown House, Aldwych, London, W.C.2.—A revised leaflet on A.R.P. street lighting lanterns. Also details of "Mazdalux" internally illuminated A.R.P. location and direction signs.

Stanelco Products, 25, Ferndown, Northwood Hills, Middlesex.—A catalogue of electrode soldering equipment.

Information Department

GENERAL inquiries from readers relating to sources of electrical goods, makers' addresses, &c., are replied to by our Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Our extensive records enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the following:—

VICKERS electric sewing machine.

ELECTRICITY SUPPLY

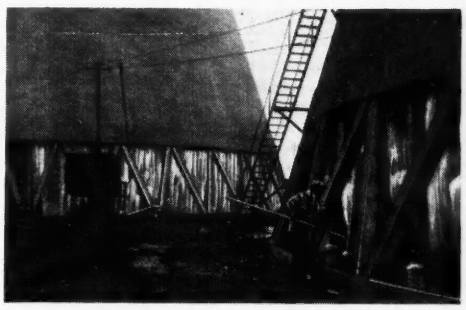
Abnormal Consumption at Birmingham. Another Gas and Electricity Amalgamation Proposal—at Lytham St. Annes. Ice on Overhead Lines in North Wales

Birmingham.—EFFECT OF COLD WEATHER.—Figures issued by the Electric Supply Department reveal the extent to which householders used domestic electric heating appliances during the recent cold weather. They show that on Sunday, January 21st, 2,673,000 kWh was consumed, an increase of 82 per cent. compared with the corresponding Sunday a year ago. On some of the sub-stations supplying residential districts the load was three times as much as the normal winter demand.

BATTERY LIGHTING IN SHELTERS.—The Health Committee is to install battery lighting equipment at four institution air-raid shelters at a cost of £170.

Blackburn.—HIGHER TRANSMISSION VOLTAGE.—The electrical engineer (Mr. R. H. Harral) has submitted to the Electricity Committee proposals of the Central Electricity Board for an increase in the transmission voltage at the Whitebirk station from 6.6 to 33 kV and a similar change in the voltage of the Board's supply to the Corporation, at a cost to the Corporation of £9,000. This is covered by the scheme for the extension of the Whitebirk station.

LOAN SANCTION DELAY.—A complaint that difficulty and inconvenience were caused by the delay of the Electricity Commissioners in issuing consent to the exercise of borrowing powers in respect of expenditure incurred by the electricity undertaking was made by the borough treasurer at a recent meeting of the Finance Committee. It was decided that the borough treasurer should interview the various Government Departments with a view to expediting the issue of the requisite consents.



An unusual condition encountered by power station engineers is illustrated in the accompanying photographs taken during the recent cold weather. In many instances the "air lanes" of the cooling towers were completely screened by ice down to the pond water level

Cardiff.—DISTRIBUTION SCHEMES.—It is proposed to extend the mains from the Heath estate to Birchgrove and Mynachdy sub-stations at a cost of £1,375, from Sanatorium Road to Cowbridge Road (£1,464), from Ely to Ty Coch Road sub-station (£3,885) and from Earls Court Road to Llandennis Gardens sub-station (£3,240).

COMPLETION OF RING MAIN.—The Electricity Committee reports that the Electricity Commissioners have approved the scheme for the completion of the 33-kV ring main between Roath power station and Sanatorium Road.

POWER STATION EXTENSION.—The C.E.B. has intimated that the second extension of the Roath power station, for which a direction has already been issued, may be proceeded with on the understanding that it will not be accelerated for operation in 1941.

Cornwall.—OPPOSITION TO BILL.—A unanimous decision to join the Penzance Borough Council in the presentation of a joint petition against the Bill which is being promoted by the Cornwall Electric Power Co. was reached by the Kerrier Rural District Council at a special meeting on January 29th, and a sum of £10 was voted towards the expenses of the petition.

Coventry.—LOAN APPLICATION.—The Electricity Committee is applying for permission to borrow £50,000 for mains extensions and £7,794 for a special extension.

Darlington.—HEAVY SUNDAY DEMAND.—Last week we mentioned (as reported in the local Press) that the output at Darlington on January 21st was 53 per cent. higher than on the corresponding day last year. Mr. T. E. Daniel, the borough electrical engineer, informs us, however, that the increase was actually 83 per cent.

Eastbourne.—INSTALLATIONS AT WARDENS' POSTS.—The Emergency Committee is to install electricity and provide Belling boiling plates at six wardens' posts at a cost of £32.

East Ham.—PRICE INCREASE.—The Electricity Committee recommends an increase in charges of 20 per cent.

Falkirk.—TARIFF REVISION.—To meet wartime conditions it has been decided to make certain additions to the electricity charges which, however, remain among the lowest in Scotland. The lighting rate for ordinary consumers is raised by ½d. to 3d. per kWh, with a minimum charge of 10s. per annum. Under the domestic lighting and heating rate there is an advance in the primary charge, but the price of all consumption over the basic quantity remains at ½d. per kWh.

Hastings.—LOAN FOR EXTENSION.—The Electricity Committee has obtained sanction for a loan of £1,250 for the construction of an overhead line from Battle to Crowhurst.

Hebden Royd.—PRICE INCREASE.—An increase of ¼d. per kWh in the lighting flat rate was approved by the Council last week.

LOAN APPLICATION.—Permission is being sought to borrow £2,000 for electricity purposes.

Heston and Isleworth.—NEW PLANT.—Subject to the consent of the Electricity Commissioners the Borough Council is to purchase a 600-kVA transformer to replace an existing 300-kVA unit. Additions and extensions to plant are to cost £5,190.

Hull.—LIGHTING PUBLIC SHELTERS.—The Emergency Committee has arranged for the Electricity Department to provide lighting at public shelters at a cost of £10 per shelter and emergency lighting at £2 3s. per shelter.

METERS.—Permission is being sought to borrow £5,000 for prepayment meters.

Lake District.—ALTERNATIVE SCHEME ADOPTED.—Negotiations which resulted in the adoption of an alternative electricity scheme are referred to in the January "News Letter" of the Friends of the Lake District. A proposal by the Central Electricity Board, the secretary says, would have brought the steel towers from the foot of Bassenthwaite under Skiddaw into Keswick, but the C.E.B. had agreed with the Mid-Cumberland Electricity Co. for the required supply to Keswick to be from the company's existing 11-kV line, which was carried on wooden poles from the foot of Bassenthwaite through the same country, passing just outside Keswick. This line would be reinforced by the creation of a ring line between Keswick and Penrith, for which purpose the gap between Threlkeld and Penruddock would be filled in by a new section of overhead line (again on wooden poles) to complete the full ring. On the siting of this new section of overhead line the Mid-Cumberland Co. consulted with the society, and the route agreed between them as best crossed somewhat barren country.

Leicester.—INCREASED CHARGES.—At its meeting on January 30th the City Council agreed to the recommendation of the Electricity Committee that the standard maximum demand tariff for power and light taken through a single service should be increased by 7½ per cent. There will be no increase in the domestic two-part tariff, slot meter rate and annual contracts.

London.—ST. MARYLEBONE.—The Works Committee is to provide screened electric lamps for refuges at a cost of £2,010.

Lytham St. Annes.—SUGGESTED AMALGAMATION OF DEPARTMENTS.—A proposal to amalgamate the Gas and Electricity Departments as a Power and Light Department has been discussed by a special committee, and the town clerk, borough treasurer and departmental officials are to prepare a comprehensive report for consideration by the Council.

Manchester.—LOAN.—The Electricity Committee is applying for permission to borrow £25,200 for sub-station equipment and feeder cable.

Northern Ireland.—BOARD INCREASES CHARGES.—The Northern Ireland Electricity Board announces an increase of 10 per cent. on quarterly accounts (excluding hire charges) which are not already subject to a 10 per cent. advance. The 5 per cent. cash discount on monthly power accounts is being withdrawn. Rentals of 5s. per annum are to be charged on all prepayment

meters, and fixed minimum charges are increased. The Board refers to the severe fall in revenue caused by lighting restrictions and economy by consumers.

North Wales.—SUPPLY INTERRUPTION.—Mr. R. Alan S. Thwaites, engineer and manager of the North Wales Power Co., has issued a statement dealing with the interruption in the electricity supply in North Wales. He attributes the trouble to fine particles of ice and rain freezing round the overhead conductors, so that in isolated positions on high ground the normal ⅜-in. diameter was sometimes increased to more than 4 in. The extra weight, together with a wind of high velocity, was in some instances enough to break the conductors, bend the ironwork, smash the insulator pins and even to drag the poles to within 6 ft. of the ground. Conway, Colwyn Bay and Llandudno were normally fed by five different circuits, but all were put out of action.

Paisley.—HIGH PEAK LOAD.—At noon on Tuesday, January 23rd, the maximum load was 12,800 kW—80 per cent. higher than at the corresponding time last year.

Peterborough.—DISTRIBUTION EXTENSION.—The City Council is considering the provision of an additional electricity main to Westwood works, to cost £2,990.

Petersfield.—PARLIAMENTARY BILL OPPOSED.—When a decision was made by the Rural District Council last week to oppose the Farnham Gas and Electricity Bill, the view was expressed that many of the provisions were inconsistent with the legislation which was proposed following the publication of the McGowan Report. One of the grounds of objection to the Bill was proposals with regard to the relationship between electricity prices and dividends, and the relative prices of gas and electricity. A further important point was that the borrowing appeared to the Council to be much in excess of the company's requirements.

Sheffield.—DISTRIBUTION PROJECTS.—The Electricity Committee has purchased a site in Stanley Street for the erection of a sub-station. The Committee is also to extend the mains at a cost of £18,945.

Shipley.—HIRE-PURCHASE RECOMMENDATIONS.—The U.D.C. Electricity Committee recommends that all applications for apparatus on hire-purchase terms should be submitted to the treasurer and accountant for his approval in writing, from the standpoint of the financial stability of the prospective purchasers, before any goods are supplied. It is also proposed that no appliances of less than £2 10s. in value should be supplied on hire-purchase terms; that the initial payment should be fixed at 15 per cent. of the h.p. price of the apparatus, and that canvassing for hire-purchase should be limited to canvassers employed by the Council.

APPLIANCES FOR HIRE.—The Electricity Committee is seeking sanction to borrow £5,000 for electrical appliances for hire.

Spalding.—SUPPLY TO COUNCIL HOUSES.—It was reported to the Rural District Council last week that it had been decided to extend the electricity supply to a number of Council houses at Gosberton.

Warrington.—C.E.B. SUB-STATION SITE.—The Corporation has leased a site in Howland Yard to the Central Electricity Board for the erection of a grid sub-station.

West Bromwich.—MAINS AND SERVICES.—The Electricity Committee is seeking sanction to borrow £10,000 for mains and services.

Willesden.—NO INCREASE IN CHARGES.—A welcome statement at a recent meeting of the Borough Council was an announcement that it had been found unnecessary to raise the electricity charges.

TRACTION

Bexhill.—PROPOSED SUB-STATION.—The Corporation has leased a site at Polegrove to the Hastings Tramways Co. for the erection of a sub-station.

Cardiff.—TROLLEY-BUS SCHEME CURTAILED.—Owing to objections by the Bishop of Swansea and Brecon, the Representative Body of the Church in Wales, the Dean and Chapter of Llandaff Cathedral, the Llandaff Parochial Church Council, and residents, the Corporation has abandoned the proposal to run trolley-buses on certain routes, but the main scheme is being proceeded with.

Darwen.—FLUORESCENT ILLUMINATION OF OVERHEAD LINES.—It is reported in the *Passenger Transport Journal* that to assist tram conductors in altering the trolleys in the black-out an experiment is being carried out with a large-sized pan coated with fluorescent powder attached over the tram wires at the Whitehall turning point and illuminated by ultra-violet-ray lamps.

Hull.—LOSS ON TRANSPORT UNDERTAKING.—A probable deficit on the current year's working of the Transport Department of £10,418 and a loss of £49,926 during the coming year were indicated in estimates placed before the Transport Committee recently. The position for the current year is the net result of an estimated loss on the trams of £15,283, and profits on the motor-buses and trolley-buses of £3,769 and £1,096 respectively. The loss on the trams is less than was originally estimated, but there is also a reduction in the profits on the other two services. Next year it is expected that there will be a deficit on all the systems—trams, £29,180; motor-buses, £16,228; and trolley-buses, £4,518. At the meeting of the committee, Mr. D. Bellamy, acting transport manager, submitted several recommendations, which were approved, including a revision of fares to take effect from April 1st next, and embodying the following provisions: An average mileage or stage charge throughout the whole of the city area based upon distance regardless of density of traffic, subject to a maximum fare of 3d. and a minimum of 1d., and to a protective fare being established in respect of trolley-buses and trams.

London.—ONE CLASS ON UNDERGROUND TRAINS.—From last week the distinction of first- and third-class accommodation ceased on L.P.T.B. trains except the "through" trains between the Aylesbury and Watford joint lines and the Metropolitan line. Some 450 doors separating first- and third-class accommodation are being removed.

Public Utilities

Gas Industry Nominates Electrical Chairman of Conjoint Conference

AT the annual meeting of the Conjoint Conference of Public Utility Associations held in London last week Mr. W. B. Woodhouse, managing director of the Yorkshire Electric Power Co., was elected chairman in succession to Sir Albert Atkey, of Nottingham, who represented the water undertakings. This is the ninth occasion in the last twelve years that Mr. Woodhouse has been elected chairman. It was the turn this year of the representatives of the gas industry to make a nomination, and they put forward Mr. Woodhouse.

Acknowledging the compliment paid to him by the representatives of the gas industry, Mr. Woodhouse said that it illustrated the broad view adopted by that industry and their willingness at all times to co-operate with the electricity and water undertakings in matters of common interest. All these utilities had vital obligations to the public, and many of the legislative and other problems which affected one concerned the others also; hence the desirability of common action and joint representation to the Government Departments, or other interests concerned. This co-operation was appreciated by the Government and other bodies, and the fact that the capital expenditure of the interests represented exceeded one thousand million pounds sterling was sufficient indication of the important part played by these undertakings in the life of the country.

At the same time, he pointed out, their joint association in no way interfered with a healthy and friendly competition between the electricity supply industry and the gas industry, which assured consumers and potential consumers of the best service, and all the benefits of progress which competition brought. If any additional assurance were needed it was to be found in the fact that the Conjoint Conference contained representatives of practically all municipal and company undertakings. The Conference carried out unobtrusively a valuable public work, and one of the utmost importance to the public utilities of the country.

The annual report of the Conference indicated the wide scope of the subjects considered by the Council and by the Coal, Rating and Valuation, and Mains and Cables Committees. Since the outbreak of war representatives of the Conference had been able to take action in the interest of the members, and although no Bill of major importance among peace-time measures reached the Statute Book, a number of Bills were considered and representations made upon them. Long experience of collaboration made it possible for a Joint Committee of electricity and gas representatives to consider the Fuel and Lighting Order, and an early result of their action was the modification of the Order and its subsequent withdrawal.

Following discussions between representatives of the highways authorities, the Conjoint Conference and the Government over a long period of years, the Government decided to set up a Joint Committee of both Houses of Parliament to deal with the question of mains and cables in highways. Evidence was given on behalf of the Conjoint Conference before this Committee. The contentions of the Conference were approved by the Joint Committee, and the report which was subsequently issued laid down the principle that the incidence of liability for the cost of removing sub-service works should be borne by the party which initiated the proposal to effect an alteration of the highway which necessitated the removal or alteration of the apparatus, and so entailed the cost.

NEW PATENTS

Electrical Specifications Recently Published

Compiled by a firm of chartered patent agents. The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. each) can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1938

4977. "Electric motor control systems." British Thomson-Houston Co., Ltd., H. W. C. Liddiard and T. H. Petch, jun. February 15th, 1939. (516666.)

15223. "Method of and means for indicating the direction of a magnetic field of any kind." H. Hughes & Son, Ltd., D. O. Sproule and A. J. Hughes. May 21st, 1938. (516723.)

17065. "Electric gaseous-discharge illuminating devices." British Thomson-Houston Co., Ltd. June 22nd, 1937. (516868.)

17242. "Electric lighting systems." G. Mackinlay (trading as Mackinlay & Co.), J. D. Mackinlay and A. S. Sutherland. June 10th, 1938. (516769.)

19623. "Contact or switch device for use in connection with electrical systems for recording the departure and/or arrival time of vehicles." W. Newman & Sons, Ltd., H. C. Shead and T. T. Deakin. July 2nd, 1938. (516673.)

19674. "Adjusting or selecting mechanism for control members, for example in radio receiving apparatus." J. E. Jones, R. E. Rhys-Bazin, R. E. Howard, and Plessey Co., Ltd. July 2nd, 1938. (516674.)

19752. "Lighting fittings." British Thomson-Houston Co., Ltd., and R. Maxted. July 4th, 1938. (516679.)

19779. "Devices for the automatic graphic recording of vector loci of alternating current values." Siemens & Halske Akt.-Ges. July 23rd, 1937. (516685.)

19900. "Electro-magnetic contactors." Standard Telephones & Cables, Ltd., and W. F. Russell. July 5th, 1938. (516696.)

19901. "Wave amplifying systems." Standard Telephones & Cables, Ltd., and A. H. Roche. July 5th, 1938. (516697.)

19932. "Condenser dielectric of titanium oxide." Rosenthal-Isolatoren Ges. Werk Selb. July 5th, 1937. (516704.)

19943. "Methods of testing the insulation of electrical machinery and apparatus." Siemens Schuckertwerke Akt.-Ges. July 5th, 1937. (516710.)

19985. "Electron-discharge devices for use in television and like systems." Fernseh Akt.-Ges. July 6th, 1937. (516737.)

20022. "Telephone systems." Automatic Telephone & Electric Co., Ltd., and C. E. Beale. July 6th, 1938. (516741.)

20023. "Telephone systems." Automatic Telephone & Electric Co., Ltd., T. B. D. Terroni and D. Wright. July 6th, 1938. (516742.)

20028. "Electro-magnetic deflecting systems for cathode-ray tubes." Telefunken Ges. für Drahtlose Telegraphie. July 6th, 1937. (516743.)

20042. "Thermionic amplifiers." O. B. Sneath. July 6th, 1938. (516745.)

20043. "Amplification control in thermionic amplifiers." July 6th, 1938. (516872.)

20060. "Fused salt electrolysis cells." E. I. Du Pont de Nemours & Co. July 6th, 1937. (516775.)

20142. "Rectifiers for supplying DC voltages from an AC source to radio receiving sets and the like." General Electric Co., Ltd., W. H. Aldous and D. C. Espley. July 7th, 1938. (516782.)

20143. "Rectifiers for supplying voltage to pentode and like valves." General Electric Co., Ltd., W. H. Aldous and D. C. Espley. July 7th, 1938. (516783.)

20162. "Electron multipliers." Baird Television, Ltd. (Fernseh Akt.-Ges.). July 7th, 1938. (516785.)

20170. "Braun tubes." Siemens Apparate und Maschinen Ges. July 7th, 1937. (516786.)

20175. "Hysteresis torque motors." British Thomson-Houston Co., Ltd. July 13th, 1937. (516820.)

20257. "Electro-magnetic wave signalling systems." W. J. Tennant (American Optical Co.). July 8th, 1938 (516793.)

20277. "Thermionic valve circuits." Scophony, Ltd., and S. H. M. Dodington. July 8th, 1938. (516749.)

20285. "Electron oscillators for generating electro-magnetic waves of ultra-high frequencies." Standard Telephones & Cables, Ltd. July 31st, 1937. (516750.)

20286. "Apparatus for testing and taking measurements on electrical elements at high frequencies." Standard Telephones & Cables, Ltd., R. M. Barnard and W. Kram. July 8th, 1938. (516799.)

20287. "Railway signal and or points control equipment." Standard Telephones & Cables, Ltd., J. B. Griffiths and A. Brown. July 8th, 1938. (Addition to 496495.) (516800.)

20288. "Push-button operated radio receivers." Kolster Brandes, Ltd., and R. S. Lawrence. July 8th, 1938. (516801.)

20289. "Electrical communication secrecy systems." Standard Telephones & Cables, Ltd., and C. P. Ross. July 8th, 1938. (516802.)

20290. "Thermionic valve arrangements for the generation of harmonics or the production of special wave form." Kolster-Brandes, Ltd., and P. K. Chatterjea. July 8th, 1938. (516803.)

20300. "Illuminated advertising or display apparatus." L. Hirschfeld and G. H. Le Grys. July 8th, 1938. (Cognate application 10656/39.) (516821.)

20532. "Reception of oscillations of modulated frequency or phase." Dubilier Condenser Co. (1925), Ltd. July 11th, 1937. (516830.)

20,660. "Switchboard cord-braiding machine." Standard Telephones & Cables, Ltd., and W. J. L. Wildbore. July 12th, 1938. (516889.)

20661. "Mounting racks for thermionic amplifiers." Standard Telephones & Cables, Ltd. K. G. Hodgson and M. A. Lalande. July 12th, 1938. (516890.)

20665. "Wave transmission systems." Kolster Brandes, Ltd., and C. N. Smyth. July 12th, 1938. (516891.)

20671. "Devices for registering call charges in communication transmission systems." W. J. Tennant (M. Mathias). July 12th, 1938. (516892.)

20672. "Means for automatically signalling the presence of vehicles provided with overhead electric trolleys while moving in a junction section set for the branching route." Soc. Anon. Brevetti Arturo Perego. July 29th, 1937. (516893.)

20687. "Supply arrangements for electric arc-welding." J. H. St. H. Mawdsley. July 12th, 1938. (Addition to 318948.) (516897.)

20705. "Radio tuning arrangements." W. J. Polydoroff. July 12th, 1938. (516900.)

21051. "Apparatus for electrically testing conductive articles for defects." A. H. Stevens (Sperry Products, Inc.). July 15th, 1938. (516753.)

21556. "Electric control circuits." British Thomson-Houston Co., Ltd. July 24th, 1937. (516837.)

22037. "Protection of electric arc rectifiers." British Thomson-Houston Co., Ltd., and J. C. Read. July 25th, 1938. (516840.)

22076. "Electric signalling systems." Evershed & Vignoles, Ltd., and W. T. Marchment. July 25th, 1938. (516841.)

22220. "Apparatus for producing harmonic frequency electrical waves from a base frequency." Standard Telephones & Cables, Ltd. (Western Electric Co., Inc.). July 26th, 1938. (516844.)

22298. "Continuously adjustable ohmic resistances for electric currents." C. Zeiss (a firm). August 14th, 1937. (516852.)

22314. "Electric terminals." R. Bain and H. R. Allday. July 27th, 1938. (516853.)

22391. "Radio receiving apparatus." General Electric Co., Ltd., and D. C. Espley. July 27, 1938. (516901.)

22562. "Electric signalling system for giving alarm or other signals simultaneously at a plurality of stations or positions." A. Graham & Co., Ltd., and C. H. Vaughan. July 29th, 1938. (516860.)

22592. "Electric cables." Pirelli-General Cable Works, Ltd., and H. T. Werren. July 29th, 1938. (516908.)

22631. "Ignition apparatus for internal-combustion engines." British Thomson-Houston Co., Ltd., and T. F. Robinson. July 29th, 1938. (516861.)

22632. "Electric hot-plates, or the like." British Thomson-Houston Co., Ltd., and R. S. Gilling. July 29th, 1938. (516862.)

22634. "Section insulators for contact wires of electric traction systems." British Insulated Cables, Ltd., London Passenger Transport Board, and G. H. Nisbett. July 29th, 1938. (516910.)

34812. "Regulators for dynamo-electric machines." Maschinenfabrik Oerlikon. December 17th, 1937. (Cognate application 34813/38.) (516756.)

1939

30818. "Electrical apparatus having movable contacting means." B. N. Maclarty. May 6th, 1938. (Divided out of 515688.) (516814.)

FORTHCOMING EVENTS

Institution of Electrical Engineers.—Monday, February 12th. Institution, London. 6 p.m. Informal meeting. Discussion on "Emergency Jointing of Cables." To be opened by Dr. P. Dunsheath.

Transmission Section. — Wednesday, February 14th. Institution, London. 6 p.m. "Practical Aspects of Earthing," by Messrs. E. Fawssett, H. W. Grimmitt, G. F. Shotter and H. G. Taylor.

North-Eastern Centre.—Monday, February 12th. The Newe House, Newcastle-on-Tyne. 6.15 p.m. Discussion on "Fire-fighting Equipment for Electrical Installations" (based on E.R.A. Report). Introduced by Messrs. J. Hacking and R. A. McMahon.

Western Centre. — Monday, February 12th. Merchant Venturers' Technical College, Bristol. 3 p.m. "Recent Progress in Power Rectifiers and their Applications," by Dr. W. G. Thompson.

Irish Centre. — Thursday, February 15th. Trinity College, Dublin. 6 p.m. "The Development of Electric Heating in England," by Mr. T. Illingworth.

North Midland Centre. — Saturday, February 17th. Hotel Metropole, Leeds. 2 p.m. "Operating Experience with High-voltage Alternators," by Mr. W. D. Horsley.

Royal Institution.—Friday, February 9th. Albemarle Street, W.1. 5 p.m. "Ultra-Violet and Electron Microscopy," by Dr. L. C. Martin. Friday, February 16th. 5 p.m. "Physics in Wartime," by Sir William Bragg.

Electrical Trades' Commercial Travellers' Association.—Friday, February 9th. Connaught Rooms, Great Queen Street, London, W.C.2. 12.30 for 1 p.m. Luncheon.

Physical Society.—Friday, February 9th. Birkbeck College, Chancery Lane, E.C.4. 3 p.m. Short papers.

Institution of Rubber Industry.—Monday, February 12th. Northumberland Rooms, Northumberland Avenue, W.C.2. 7.15 p.m. "What is Costing and its Relation to Price Fixing?" by Mr. D. Cairns.

Salford Technical and Engineering Association.—Saturday, February 17th. Royal Technical College, Salford. 6.30 p.m. "Magnesium Alloys," by Mr. F. A. Fox.

Junior Institution of Engineers (*Midland Section*).—Saturday, February 17th. James Watt Memorial Institute, Birmingham. 2.30 p.m. "Practical Applications of Temperature Control and Measurement," by Mr. W. M. Barratt.

FINANCIAL SECTION

New Companies. Returns of Capital. Debenture Charges. Bankruptcies and Liquidations. Reports of Electrical Companies. Dividend Announcements. Stocks and Shares

New Companies Registered

Novelectrix, Ltd.—Private company. Registered February 2nd. Capital, £1,000. Objects: To acquire the business of torch manufacturers carried on (inter alia) by Isandea, Ltd., at 11, Gillingham Street, S.W.1, and to carry on the business of manufacturers of and dealers in electric torches of all kinds, &c. Subscribers: W. J. Lovell and A. E. Isemonger, both of 199, Piccadilly, W.1. Solicitors: Bartlett & Gluckstein, 199, Piccadilly, W.1.

Elecstik Sales, Ltd.—Private company. Registered February 1st. Capital, £100. Objects: To carry on the business of electrical accessory and equipment specialists, manufacturers of and dealers in electric torches, lamps, bulbs, batteries, accumulators, &c. Directors: W. Smerdon, 112, West Road, Westcliff-on Sea; and J. Smerdon, "Birches," Hall Road, Rochford, Essex. Registered office: 4, Sweyne Avenue, Southend-on-Sea, Essex.

Nightingale Radio Services, Ltd.—Private company. Registered January 30th. Capital, £1,000. Objects: To carry on the business of manufacturers and repairers of, and wholesale and retail dealers in wireless receiving and transmitting apparatus and instruments, television and telephonic apparatus and equipment, &c. Directors: H. Nightingale and Mrs. E. Nightingale, both of 22, Stanford Road, Chorlton-cum-Hardy, Manchester. Registered office: 436, Wilbraham Road, Chorlton-cum-Hardy.

Spero Electrical Co., Ltd.—Private company. Registered January 30th. Capital, £100. Objects: To acquire the business of a dealer in electric lamps, fittings and accessories carried on by A. M. Scales at 31, Farringdon Road, E.C. Life directors: A. M. Scales, Spero House, The Byway, Sutton, Surrey; N. H. Keen, 169, Ealing Road, Alperton, Middlesex, and J. H. John, 23, Oxhey Road, Watford. Registered office: 31, Farringdon Road, E.C.1.

Chalfont Electrical Products, Ltd.—Private company. Registered January 31st. Capital, £100. Objects: To carry on the business of manufacturers, importers and exporters of, agents for and dealers in electrical goods, equipment and accessories, fittings, switches, bells, clocks, fans, vacuum cleaners, &c. Permanent directors: M. B. Lebrett, 38, Heathfield Gardens, London, N.W.11, and H. Kaye, 135, Brooke Road, London, N.16. Solicitors: Byre Cohen & Co., 1-3, St. Paul's Churchyard, London, E.C.4.

Elmat, Ltd.—Private company. Registered January 31st. Capital, £1,000. Objects: To carry on the business of electrical accessory and equipment specialists, dealers in electric torches, lamps, bulbs, clocks, batteries, &c. Subscribers: H. Bennett, 11, Broadhurst Avenue, Edgware, and M. E. Hoad, 5, Alperton Street, Queen's Park, London, N.W. Registered office: 34, Copthall Avenue, London, E.C.2.

Companies' Returns

Statements of Capital

Drake & Gorham, Ltd.—Capital, £125,000 in £1 shares. Return dated November 28th, 1939. All shares taken up. £85,000 paid. £40,000 considered as paid. Mortgages and charges, £43,019 debenture stock.

Vee Cee Dry Cell Co. (1927), Ltd.—Capital, £7,000 in 2,000 ordinary and 5,000 preference shares. Return dated November 20th, 1939. 2,000 ordinary and 4,750 preference shares taken up. £6,350 paid on 1,600 ordinary and 4,750 preference shares. £400 considered as paid on 400 ordinary shares. Mortgages and charges nil.

McGreevy Brothers (Fleetwood), Ltd.—Capital, £2,000 in £1 shares. Return dated October 14th, 1939. 1,450 shares taken up. £1,450 paid. Mortgages and charges nil.

B. French, Ltd.—Capital, £5,000 in £1 shares. Return dated November 13th, 1939. 4,750 shares taken up. £4,750 paid. Mortgages and charges nil.

Brown & Co. (Electrical Engineers), Ltd.—Capital, £5,000 in £1 shares. Return dated December 15th, 1939. 4,529 shares taken up. £12 paid. £4,517 considered as paid. Mortgages and charges, nil.

Auto Service Electrical Co. (Falmouth), Ltd.—Capital, £3,000 in £1 shares. Return dated December 15th, 1939. All shares taken up. £1,620 paid. £1,380 considered as paid. Mortgages and charges, nil.

Auto Electrical Service Co., Ltd.—Capital, £3,000 in £1 shares. Return dated December 18th, 1939. 1,002 shares taken up. £1,002 paid. Mortgages and charges, nil.

Claude B. Barton, Ltd.—Capital, £1,000 in £1 shares. Return dated December 18th, 1939. 900 shares taken up. £900 paid. Mortgages and charges, nil.

Read & Morris, Ltd.—Capital, £2,000 in 1,200 founders' shares of 1s. and 1,940 ordinary shares of £1. Return dated September 4th, 1939. 1,200 founders' shares taken up. £30 paid. £30 considered as paid. Mortgages and charges, nil.

Capital Increase

Darlington Wireless Relay Service, Ltd.—The nominal capital has been increased by the addition of £980, in £1 ordinary shares, beyond the registered capital of £12,020. 16,080 issued ordinary shares of 5s. have been consolidated in 4,020 ordinary shares of £1 each.

Mortgages and Charges

Lomax & Samways, Ltd.—Mortgage on 181 and 183, London Road, Hazel Grove, Cheshire, dated January 22, 1940, to secure £500. Holder: Mrs. E. B. Smith, "Briarwood," Chester Road, Hazel Grove.

Auto Service Electrical Co. (Falmouth). Ltd.—Mortgage on freehold garage, two lock-up shops and two flats above, on corner of Charles Street and Lemon Street, Truro, dated January 8th, 1940, to secure all moneys due or to become due from the company to the Midland Bank Ltd.

Receivers Appointed and Released

B. G. Garman, Ltd.—R. C. Deith, C.A., of 8, Paternoster Row, E.C., was appointed receiver and manager on January 22nd, 1940, under powers contained in debentures dated September 16th, 1935.

Watmough (Wakefield), Ltd.—H. Derwick, of 9, East Parade, Leeds, ceased to act as receiver and manager on January 19th, 1940.

F. Burks and Co., Ltd.—A. Whittaker, of 3, York Street, Manchester, ceased to act as receiver on January 27th, 1940.

Company Liquidations

Neon Tube-Lights (Finsbury), Ltd., Brook Road, London, N.—A meeting of creditors was held on February 1st. A statement of affairs submitted showed ranking liabilities of £292, of which £199 was due to unsecured creditors, and there were directors' salary accounts amounting to £93. After allowing £16 for preferential claims the net assets were £24, leaving a deficiency, as regarded the creditors, of £268. A resolution was passed appointing Mr. W. A. J. Smith, C.A., 2, Green Lanes, Palmers Green, as liquidator of the company.

Electric Motors Development Co., Ltd.—Meeting March 4th at 3, Thames House, Queen Street Place, London, E.C.4, to receive an account of the winding up by the liquidator, Mr. M. Moore.

Hydro-Electrical Treatments, Ltd.—Meeting March 6th at 16, John Dalton Street, Manchester, to receive an account of the winding up by the liquidator, Mr. F. S. Kott.

Bankruptcy Proceedings

E. G. Kelf, 140, Ivy Road, Cricklewood, N.W.2, and **L. F. Brewer,** 192, The Vale, Golders Green, N.W.11, lately trading in co-partnership as E.G.K., radio dealers, at 4, High Road, Willesden Green, N.W.10 (separate estate of L. F. Brewer).—First and final dividend of 11½d. in the £, payable at Bankruptcy Buildings, Carey Street, London, W.C.2.

J. A. Sheward, electrical contractor, carrying on business in co-partnership with E. C. Johnson under the style of Edstan Electric, at 20, Market Street, Hanley, and 40, London Road, Newcastle-under-Lyme.—Receiving order made January 23rd on debtor's own petition. First meeting February 9th at 12, Lonsdale Street, Stoke-on-Trent. Public examination February 29th at the Town Hall, Hanley, Stoke-on-Trent.

A. L. Pearce, electrical supplies dealer, 12, Fore Street, Newquay.—Application for discharge to be heard on March 15th at the Town Hall, Truro.

W. E. Sparrow and **F. Sparrow** electrical contractors, 8, Longsmith Street, Gloucester.—Last day for receiving proofs for dividend February 20th. Trustee, Mr. H. Wheeler, 26, Baldwin Street, Bristol, Official Receiver.

Reports and Dividends

The City of Buenos Ayres Tramways reports that no amount has been received in respect of annuity payable by the Anglo-Argentine Tramways Co. in accordance with the agreement made in March, 1938, arranging a moratorium until July 1st, 1940. The balance of revenue account is £1,814 (against £1,825), plus £998 brought in, making £2,812. Of this £2,000 has been placed to amortisation fund, leaving £812 to be carried forward.

The London Passenger Transport Board has announced that the terms of compensation payable by the Government by virtue of its control of the undertakings of the Board have not yet been settled. Consideration of the interim payment of interest on "C" stock for the year ending June 30th has therefore been postponed.

The Power Securities Corporation, Ltd., reports a net revenue for 1939 of £75,897, as compared with £95,298 for 1938. The dividend for the year is maintained at 7 per cent.

Peter Brotherhood, Ltd., is again paying an interim dividend of 8 per cent.

The Electrical and Industrial Investment Co., Ltd., is paying a dividend of 12 per cent. on the deferred ordinary shares, less tax, for 1939 (against 10 per cent. for 1938).

The Direct Spanish Telegraph Co., Ltd., is paying a first and final dividend of 5 per cent. (against 6 per cent.).

The Yorkshire Electric Power Co. has declared a final ordinary dividend of 4.654 per cent., less tax, maintaining the distribution for the year at 8 per cent.

The London Electric Supply Corporation, Ltd., has announced a final dividend of 4 per cent., less tax, making 7 per cent. for the year (against 7 per cent., plus 1 per cent. bonus).

Ensign Lamps, Ltd., is paying an interim dividend of 10 per cent. (same).

The Electrolux Corporation (of America) has declared a quarterly dividend of 30 cents per share (40 cents a year ago).

The Yorktown (Camberley) and District Gas and Electricity Co. has announced a final dividend of 3¼ per cent. on the 5 per cent. standard consolidated ordinary shares, making 6 per cent. for the year (against 6¼ per cent.).

STOCKS AND SHARES

TUESDAY EVENING.

THE number of bargains recorded in the Stock Exchange lists on the first day of the present week was nearly 6,300; the largest since the outbreak of war. Nevertheless it would appear as though general activity throughout the markets has fallen away to some extent as compared with a week ago when, notwithstanding the rigours of the weather, the dealings in British Government securities reached an exceptionally high figure.

Again the outstanding feature of Stock Exchange markets is the demand for investment stocks and shares, coupled with the difficulty of supplying it from sources generally available. A country broker wired to his London Stock Exchange man a day or two ago, asking for a list of good electricity supply preference shares on offer in the market. The broker wrote back to say that he was ashamed to admit it, but that, so far as his individual inquiries went, all he had been able to discover was a trio of small lots of preference shares at prices which he himself regarded as being extremely expensive. The three lots amounted, altogether, to something under 500 shares.

Gilt-edged

Although activity in the gilt-edged market has tailed off to some extent, the turnover is still of substantial dimensions, with the balance of orders slightly in favour of the bulls. For the first time in over twelve months, War Loan has again been sold at 99. That figure seems to be, for the moment, the point of resistance at which profit-taking checks the upward tendency. The quotation has now slipped back a small fraction. Following the Government's offer of a short-dated 2 per cent. issue to replace the 4½ per cent. Conversion Loan—the news of which was the mainspring of the rapid January ascent of gilt-edged prices—the tendency is still to conclude that popular loans can be floated on the necessarily large scale at around 3 per cent. interest. A few questioning voices ask whether long-term conclusions can properly be drawn from a very short-dated issue; but, for the present, the War Loan is being shouted home up the straight which leads to the 100 mark.

Yields of Trustee Stocks

Pruning of yields on gilt-edged securities is increasingly evident among the various Electricity Board stocks and kindred investments. The Central Electricity Board issues remain in the shortest supply. Of the London Transport Board issues, the 4½ per cent. T.F.A. stock redeemable 1942-72—a trustee security with the Government's guarantee—has become what the money markets call a "short," the price of 104½ indicating payment at 100 two years hence, and allowing a redemption yield of less than 2½ per cent. The popularity of medium-dated stocks quoted under par is evident in two other trustee stocks, one the London Electric Transport Finance 2½ per cent. guaranteed stock 1950-55, offered at 91½, to yield £2 14s. 4d., or £3 2s. 9d. with the profit on redemption; the other, the Railway Finance 2½ per cent. guaranteed debentures, 1951-52, at 94½, on which the current yield is £2 12s. 6d. per cent., and the redemption yield barely 3 per cent.

Debenture and Preference Stocks

Because of the persistent and largely unsatisfied demand for debenture and preference stocks of good repute, the practice of recent weeks is continued, of setting out here a table of investments which are occasionally to be found in the market:—

Stock or Share	Per Cent.	Price	Yield % £ s. d.
B.C. & H. Power Deb. 1943/63	3½	94½	3 14 0
North Eastern Elec. Deb.	5	104	4 16 3
North Met. Power Station 2nd Deb.	3½	96	3 13 0
Electric Construction Perp. Deb.	4	92	4 7 0
Clyde Valley Elec. 2nd Pref.	8	36/3	4 8 3
City of London 1st Pref.	6	28/–	4 5 9
Llanelly & District Elec. Pref.	6	26/–	4 12 3
Palestine Elec. 2nd Pref.	4½	18/–	5 0 0
Atlas Electric Pref.	7	20/6	6 16 6
British Electric Transformer Pref. (Guaranteed by Crompton Parkinson)	5	21/3	4 14 0
Crabtree Electrical Industries Pref.	5	22/–	4 11 0
Electrical Switchgear Mfrs. Pref.	5	20/–	5 0 0

Electricity Supply Shares in the Ascendant

Yorkshire Electric has satisfactorily opened the electricity supply market's dividend season with an 8 per cent distribution—the same as for last year, but payable on a larger capital, the 825,000 ordinary shares issued a year ago ranking for the final dividend payment. The flow of investment, seeking a living rate of interest with security, often turns nowadays from purely safety-first channels into the most reputable class of equity investments. Rising prices for bank and insurance shares reflect the tendency. In the market for electricity supply shares, the stirring of interest noted a week ago has been well maintained. As a generalisation, it might be said that this market had moved up 1s. a week ago, and has hardened by a further 6d. this week. Average yields from the shares—based on last year's dividends—are inclined to fall under the 5 per cent. mark, except in such instances as the London companies' issues, where the disposition remains to discount some reduction in the coming dividends. In considering the yields, account has to be taken of the fact that most prices are—in the market phrase—full of dividend, allowance for which would enhance the returns now showing.

Price Changes

Inquiry continues to busy itself with the oldest favourites among electricity supply shares. Edmundsons, for instance, have been bought up to 25s. 6d., as compared with 23s. 6d. only a fortnight ago. Yorkshire Electrics are a further 9d. to the good at 35s. 9d. ex dividend at which the yield is a bare 4½ per cent. Bournemouth & Pooles are up to £3, having gained half a crown in a fortnight. County of London and Metropolitans, both at 37s. 6d., show improvement in the London group. The market is prepared for a cut in the London Associated dividend from the regular 7 per cent. to 5 per cent. at the most. These shares stand at par. Scottish Power, at 33s. 9d., North-Easterns, at 29s., Midland Counties at 36s. 3d., and Electricity Supply Corporations, at 42s. 6d., are all better. British Power & Light, at 27s. 6d., also witness the cheerful atmosphere which pervades the market.

Industrial Markets

For the most part, the industrial and more speculative markets can show, as yet, no more than a pale reflection of the glory of the gilt-edged and railway markets. Prices are firm enough, but the paucity of business is thrown into relief by the brightness in and around the safety-first areas. Not that the industrial sections are without their features, for, if the volume of business suffers by the comparison, the yields of 5 per cent. upwards which these markets have to offer, automatically look more generous. Investment demand seems to have broadened out to the point where it laps the edges of the industrial markets, touching, at present, only the leading equities. On logical grounds, the movement might well be expected to spread further. In the face of such considerations, however, as the coming Budget and the many unknown quantities of wartime conditions, logic is at something of a discount in market forecasts. The rather negative behaviour of prices suggests that investors are in no hurry to make up their minds on the matter.

Equipment and Manufacturing

General Electric shares have followed up a gain of 1/6 with another of ¼, rising to 78s. 9d. and so demonstrating that investment is anything but indifferent to the comparatively generous yields on leading industrials. Improvements in Associated Electrical Industries, to 38s. 9d., Callender's Cables, to 62s. 6d., and British Insulated, at 81s. 3d., give point to the same tendency. Westinghouse Brakes have risen from 35s. to 38s. 9d. since the publication of the report, recovering the setback occasioned by the cut in the dividend from 17½ to 10 per cent. The full accounts do not show the figure set aside as reserve against contract losses which are supposed to have arisen from work for the Polish railways, and to have been responsible for the sharp contraction of profits. In advance of the annual meeting, recovery in the shares seems based on the impression that the board has been very conservative in this matter. International Combustion shares have been in demand since the annual report and meeting. At 5¼, the price is a further half a crown to the good. Tube Investments move steadily upwards, and, at 92s. 6d., are now 1s. higher than at any time last year.

Traction and Transport

A rise of half a crown to 40s. in the price of T. Tillings shares marks general satisfaction with the increase of net profits shown in the figures, and with the maintenance of the dividend at 10 per cent. Opinion has again been intrigued by the marking of bargains in London Transport "C" stock at, and a fraction above, the fixed minimum price of 65. The decision to pass the interim dividend had been taken for granted. Uncertainty surrounds the question of when the Government will announce the terms of the Board's wartime compensation, and whether these will be published simultaneously with those relating to the main-line companies. As to the terms themselves, most people will be pleasantly surprised if they come up to what is apparently expected by those who are taking an interest in the "C" stock at such a price as 65. Interest in the Home Railway market became actively bullish in anticipation of the announcement, due this week in Parliament, on the wartime compensation agreement.

Miscellaneous Matters

Power Securities Corporation shares have changed hands at around 21s. 6d. since the decision to pay the regular 7 per cent. dividend despite a contraction (after taxation) in net revenue. This company's business is to finance electrical and allied undertakings, and includes the control of the Balfour Beatty company. Overseas electricity supply shares were not to be left out of the return of activity to the Home group. Palestine Electrics, at 23s. 9d., Madras Electrics, at 22s. 6d., Kalgoorlie Electrics, at 11s., all took a turn for the better. The preference shares of Whitehall Electric, a company with electrical interests in Greece, gained a florin to 15s. On the other hand, Victoria Falls fell 1s. 3d. to 71s. 3d. on South African political events, and Perak Hydros shed the same amount to 18s. 9d. Among communication stocks, Cable and Wireless ordinary is reactionary at 60½ after the long ascent, but the preference is well supported at 99½ and the income stock at 97½ show a gain of 2. Telephone Rentals have hardened to 8s. 6d.

ELECTRICAL COMPANIES' SHARES

Prices, Dividends and Yields

Company	1939 High-est	1939 Low-est	Dividend Pre-vious	Dividend Last	Price Feb. 6	Rise or Fall	Yield p.c. £ s. d.
Home Electricity Companies							
Bournemouth and Poole	68/3	56/–	15	15	60/–	+⅛	5 0 0
British Power and Light	30/9	21/–	7	7	27/6	+6d.	5 1 10
City of London	33/9	22/–	7⅛	7⅛	26/6	—	5 13 2
Clyde Valley	38/6	26/9	8	8	35/–	—	4 11 5
County of London	46/9	28/–	10½	10½	37/6	+6d.	5 12 0
Edmundson's:							
7% Pref.	31/6	27/6	7	7	29/–	—	4 16 7
Ord.	27/9	18/–	9	6	25/6	+6d.	4 14 0
Elec. Dis. Yorkshire	41/6	32/–	9	9	36/3	—	4 19 5
Elec. Fin. and Securities	48/3	39/–	12½	12½	40/–	—	6 5 0
Elec. Supply Corporation	51/9	40/–	12	12	42/6	+⅛	5 13 0
Isle of Thanet	20/–	15/–	4	4	15/6	—	5 3 3
Lancs Light and Power	34/6	25/–	7½	7½	31/3	—	4 16 0
Llanelly Elec.	22/6	16/6	5½	5½	20/–	—	5 10 0
Lond. Assoc. Electric	30/–	18/–	7	7	20/–	—	7 0 0
London Electric	34/3	20/–	7	7	26/3	—	5 6 8
London Power Deb. Red.	106½	97	5	5	104½	—	4 15 6
Metropolitan	51/–	32/6	12	12	37/6	+6d.	6 8 0
Midland Counties	39/6	30/–	8	8	36/3	+6d.	4 8 6
Mid. Elec. Power	41/9	33/6	8	9	36/3	—	4 19 4
Newcastle Elec.	28/9	25/–	7	7	26/3	—	5 6 8
North Eastern Electric:							
Ordinary	32/3	23/6	7	7	29/–	+6d.	4 16 7
7% Pref.	32/6	26/–	7	7	30/6	—	4 11 10
Northampton	48/–	41/–	10	10	42/6	—	4 15 0
Notting Hill 6% Pref. (£10)	13½	10½	6	6	10	—	—
Northmet Power:							
Ordinary	46/6	30/6	10	10	38/3	+⅛	5 4 7
6% Pref.	29/–	23/6	6	6	27/–	—	4 9 0
Richmond Elec.	29/–	21/6	7	7	23/9	—	5 18 0
Scottish Power	38/9	27/6	8	8	33/9	+6d.	4 14 10
Southern Areas	22/9	17/–	5	5	19/6	+6d.	5 2 7
South London	30/9	22/–	7	7	22/–	—	6 7 3
West Devon	23/3	18/–	5	5	18/9	—	5 6 8
West Glos.	21/3	15/–	2	2½	17/6	—	2 17 2
Yorkshire Elec.	38/6	27/9	8	8	35/9xd.	+⅛	4 9 5
Overseas Electricity Companies							
Atlas Elec.	4/3	1/6	Nil	Nil	2/9	—	—
Calcutta Elec.	39/–	25/–	10*	10*	32/–	+6d.	—
Cawnpore Elec.	34/6	27/3	10	10	28/9	—	—
East African Power	26/3	20/–	7	7	23/6	—	5 19 2
Jerusalem Elec.	24/6	21/–	7	7	21/6	—	6 10 4
Kalgoorlie (10/–)	10/6	9/–	7½	7	11/–	+6d.	6 7 4
Madras	31/–	21/3	8*	8*	22/6	+6d.	—
Montreal Power	35½	30	1½	1½	34	—	—
Palestine Elec. "A"	27/3	19/6	7½*	5*	23/9	+⅛	4 4 2
Perak Hydro-electric	19/6	12/6	6	2½	18/9	−⅛	2 13 4
Shawinigan Power	25	20	85cts.	83cts.	24	−1½	—
Tokyo Elec 6%	63	33	6	6	65½	—	9 0 6
Victoria Falls Power	73/9	60/–	12½	15	71/3	−⅛	4 4 3
Whitehall Investments Pref.	19/6	10/–	7½	7½	15/–	+2/–	10 0 0
Public Boards							
Central Electricity:							
1950–70	112	103	5	5	108xd.	+1	4 12 7
1955–75	115½	104½	5	5	110	—	4 11 0
1951–73	106½	101	4½	4½	106	+1	4 5 0
1968–93	95½	84	3½	3½	95	+2	3 13 8
London Elec. Trans. Gtd.	88½	83	2½	2½	92	+1	2 14 4
London & Home Counties 1955–75	107½	105	4½	4½	106½	—	4 4 6
Lond. Passenger Transport							
A	114½	103	4½	4½	113½	+2	3 19 4
B	117½	102	5	5	115½	+2½	4 6 7
C	83½	64½	4	1½	65	—	2 6 2
West Midland Joint Elec., 1948–68	112½	104½		5	106½	+½	4 14 0
Telegraph and Telephone							
American Tel. & Tel.	210	159	9	9	209½	—	4 6 8
Anglo-Am. Tel.:							
Pref.	101½	82	6	6	97½	+1	6 3 1
Def.	23⅜	17	1½	1½	22½	—	6 13 4
Anglo-Portuguese	24/–	16/6	8	8	20/–	—	8 0 0
Cable & Wireless:							
5½% Pref.	97	75	4⅜	5½	99½	+1	5 10 8
Ord.	57½	35	4	4	60½	−1	6 12 4
Income	100	85½	—	—	97½	+2	4 2 1
Canadian Marconi $1	6/–	3/9	—	Nil	5/–	—	—
Globe Tel. & Tel.:							
Ord.	32/3	22/6	7½*	7½*	30/–	—	5 0 0
Pref.	26/9	20/–	6	6	26/3	—	4 11 5
Great Northern Tel. (£10)	38	18	20	20	20½	—	9 15 2
Inter. Tel. & Tel.	10½	5	Nil	Nil	5½	—	—
Marconi-Marine	30/–	23/–	7½	10	27/6	—	7 5 6
Oriental Telephone Ord.	2½	42/6	12*	12*	2⅜	—	5 1 0
Radio Corpn.	8⅞	5½	8	6	7½	—	—
Telephone Props.	14/–	12/9	5	6	13/9	—	8 14 6
Telephone Rentals (5/–)	10/–	6/3	10	10	8/6	+3d.	5 17 8
Western Union	40½	19½	2½	—	32½	—	—
Traction and Transport							
Anglo-Arg. Trams:							
First Pref. (£5)	7/6	3/6	Nil	Nil	4/–	—	—
4% Inc.	16	5	Nil	Nil	9	—	—
British Electric Traction:							
Def. Ord.	950	500	5	5	675	+25	—
Pref. Ord.	164	115	8	8	155	—	5 3 4
Bristol Trams	52/6	35/–	8	10	42/6	—	4 14 1
Brazil Traction	13	6½	$1	50c.	9¾	−¼	—
Calcutta Trams	25/6	20/9	8	8	23/–	—	6 19 2
Cape Elec. Trams	18/–	16/9	5	5	17/–	—	5 17 8
Lancs Transport	37/9	27/6	10	10	29/–	—	6 18 0
Mexican Light:							
1st Bonds	35	20	5	5	30½	−4½	—
Rio 5% Bonds	82	47	5	5	78	—	6 8 2
Southern Rly.:							
5% Prefd.	75½	48	5	5	71½	+½	7 0 0
5% Pref.	99½	79	5	5	101½	+⅜	4 18 6
T. Tilling	2½	32/6	10	10	40/–	+½	5 0 0
Tilling & B.A.	54/6	43/9	9*	8*	47/6	—	3 7 10
West Riding	37/9	30/–	10	10	29/6	+9d.	6 15 7
Equipment and Manufacturing							
Aron Electricity Ord.	32/3	22/6	15	15	22/6	—	—
Assoc. Elec.:							
Ord.	45/3	30/–	10	10	38/9	+6d.	5 3 3
Pref.	36/6	30/–	8	8	35/–	+½	4 11 5
Automatic Telephone & El.	48/9	37/–	10	12½	43/9	—	5 14 2
Babcock & Wilcox	48/–	37/–	10	12½	45/–	+6d.	5 11 1
British Aluminium Ord.	61/3	48/–	12½	12½	52/–	—	4 16 2
British Insulated Ord.	88/–	70/3	20	20	81/3	+⅛	4 18 6
British Thermostat (5/–)	16/–	11/6	18½	18½	13/9	+⅛	6 14 6
British Vacuum Cleaner (5/–)	22/6	8/–	40	12½	10/–	—	6 5 0
Brush Ord.	5/9	2/6	Nil	Nil	4/–	—	—
Callender's	92/–	50/–	20	15	62/6	+½	4 16 0
Chloride Elec. Storage	82/–	62/–	20	15	3½	—	4 5 9
Consolidated Signal	96/–	60/–	36½	36½	2½	—	—
Crabtree (10/–)	25/6	16/6	17½	17½	21/3	—	8 4 9
Crompton Parkinson:							
Ord. (5/–)	21/–	12/6	15	29	17/6	—	5 14 3
E. K. Cole (5/–)	9/–	2/6	10	Nil	4/–	—	—
Elec. & Musical Industries (10/–)	14/9	6/6	5	Nil	8/6	—	—
Electric Construction	40/6	28/–	12½	13½	32/6	—	8 6 2
Enfield Cable Ord.	58/–	37/6	25	16½	47/6	—	6 16 10
Electrical Switchgear (10/–)	27/–	23/–	16	10	21/3	—	4 14 3
English Electric	36/6	25/–	10	10	30/–	—	6 13 4
Ensign Lamps (5/–	16/9	13/9	25	25	15/–	—	8 6 8
Ericsson Tel. (5/–)	43/–	32/3	25*	25*	35/–	—	3 11 5
Ever Ready (5/–)	26/6	16/9	35	30	26/6	—	5 13 2
Falk Stadelmann	27/–	18/–	10	6	17/6	—	6 17 4
Ferranti Pref.	25/6	21/–	7	7	23/9	—	5 18 0
G.E.C.:							
Pref.	32/9	25/–	6½	6½	30/–	+⅛	4 6 8
Ord.	82/–	61/–	17½	20	78/9	+½	5 1 6
Greenwood & Batley	29/–	20/–	7	15	22/6	—	13 6 8
Hall Telephone (10/–)	22/3	7/–	15	15	18/9	—	8 0 0
Henley's (5/–)	21/–	13/9	20	20	20/–	—	5 0 0
4½% Pref.	23/–	18/–	4½	4½	20/–	—	4 10 0
Hopkinsons	46/9	37/–	12½	15	43/9	—	6 17 0
India-Rubber Pref.	22/–	17/9	5½	5½	20/–	—	5 10 0
Intl. Combustion	121/3	97/–	32½	32½	5⅜	+⅛	5 13 0
J. Lucas	61/–	42/6	15	15	53/9	—	5 11 6
Johnson & Phillips	42/6	32/–	12½	12½	42/6	—	5 17 8
Lancashire Dynamo	72/–	50/–	25	25	57/6	—	8 14 0
Laurence Scott (5/–)	12/–	8/6	15	15	9/6	—	7 18 4
London Elec. Wire	31/6	25/–	12	7½	26/3	—	5 14 4
Mather & Platt	50/3	37/6	13½	13½	46/3	—	5 17 0
Metropolitan Elec. Cable Pf.	21/3	21/–	5½	5½	21/3	—	5 3 0
Murex	85/9	63/9	20	20	78/9	—	5 1 6
Pye Deferred (5/–)	11/6	7/–	25	25	7/6	—	16 13 4
Revo (10/–)	35/6	22/–	17½	17½	21/3	—	8 4 9
Reyrolle	61/–	52/–	12½	12½	57/6	—	4 7 0
Siemens Ord.	26/9	17/–	7½	7½	20/9	+9d.	7 4 7
Strand Elec. (5/–)	5/6	1/3	10	4	2/–	—	8 0 0
S. Smith (1/–)	9/6	5/6	37½	50	7/6	—	6 13 4
Switchgear & Cowans (5/–)	15/–	9/6	20	20	11/3	—	8 18 0
Telegraph Condenser (10/–)	7/6	5/–	5	—	7/6	—	—
Telegraph Construction	2⅜	27/6	10	10	35/–	—	5 14 3
Telephone Mfg. (5/–)	10/–	7/–	9	9	8/6	—	5 9 1
Tube Investments	91/6	68/–	23⅜	23⅜	92/6	+6d.	5 4 0
Vactric (5/–)	4/3	2/–	4	Nil	2/6	—	—
Vickers (10/–)	24/6	14/6	10	10	18/9	—	5 6 8
Ward & Goldstone (5/–)	22/6	19/6	20	20	19/9	—	5 1 3
Westinghouse Brake	54/9	38/–	17½	10	38/9	+⅛	5 13 3
Walsall Conduits (4/–)	31/9	21/3	55	55	25/–	—	8 16 0
West, Allen (5/–)	7/6	5/–	7½	10	5/9	—	8 14 0

* Dividends are paid free of Income Tax.

CONTRACT INFORMATION

Particulars of work for which tenders are invited, contracts placed, and building schemes promising work for electrical contractors and traders

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses. Further details of items marked with an asterisk can be obtained from the Department of Overseas Trade (Inquiry Room), Great George Street, London, S.W.1.

Australia. — MELBOURNE.—April 2nd. State Electricity Commission of Victoria. Cable for three-phase 6.6-kV system. (T. 15010-40.)*

BRISBANE.—February 28th. City Electric Light Co., Ltd. Protective relays. (T. 29997/39.)*

Belfast.—February 16th. Electricity Department. Mercury arc rectifier equipments, and fire-extinguishing apparatus. (February 2nd.)

Birkenhead.—February 13th. Electricity Department. Electric lamps for one year. (January 26th.)

Dumfries.—February 22nd. Electricity Department. One 3-panel 3,300-V switchboard, two 300-kVA and two 500-kVA transformers. (See this issue.)

Dundee.—February 14th. Electricity Department. Three-core and multi-core paper-insulated lead-covered and armoured cable for 6,600 V and 660 V respectively. Specs., &c.. from D. H. Bishop, general manager and engineer; tenders to town clerk.

Erith.—February 26th. Electricity Department. Materials for twelve months. (February 2nd.)

Gellygaer.—February 16th. U.D.C. Electrical apparatus and materials for one year. (January 19th.)

Heston and Isleworth.—February 12th. Electricity Department. Sheet-steel housing and e.h.v. truck type switch. (January 26th.)

Hull.—February 20th. Electricity Department. Stores for one year. (February 2nd.)

Iran.—TEHRAN.—March 1st. Ministry of Industry and Mines. Machinery for a cane sugar factory. (T. 23403/39.)*

Leeds.—February 16th. Electricity Department. Stores for one year. (February 2nd.)

London.—BATTERSEA.—February 14th. Electricity Department. Electrical materials for one year from April 1st. (January 5th.)

ISLINGTON.—February 27th. Borough Council. Electrical and engineers' stores for one year, or alternatively for three months with options to continue for one year. (See this issue.)

New Zealand. — WELLINGTON.—Public Works Department. March 5th. Cables. (T. 30431/39.)*

March 12th. 110-kV outdoor switchgear and steelwork. (T. 28145/39.) Six 66-kV air-break switches. (T. 15486/40.)*

March 19th. 11-kV switchgear. (T. 15487/40.)*

March 26th. Four single-phase transformer units. (T. 28143/39.)* Switchgear and steelwork. (T. 30384/39.)*

April 2nd. Switchgear and steelwork. (T. 30385/39.)*

Plymouth.—February 10th. Electricity Department. Meters, time switches, low-voltage underground joint-boxes, and stevedores' work. City electrical engineer, Armada Street.

Salford.—February 14th. Corporation. Stores. (January 26th.)

February 21st. Stores. (February 2nd).

Sheffield.—February 17th. Lighting installation at Hatfield House Lane school. W. G. Davies, city architect, Town Hall. (Deposit, £2.)

South Africa.—SALISBURY (S. RHODESIA).—April 15th. Municipality. Cables. (T. 30438/39.)*

CAPE TOWN.—March 6th. Electricity Department. Two 500 kVA (or alternatively two 600 kVA) three-phase transformers and two 50 kVA transformers. (T. 15056/40.)*

February 14th. 4,000 metal-clad combined switch and fuse boards. (T. 15678/40.)*

March 6th. Cables and jointing material. (T.Y. 15893/40.)*

March 13th. 200 electricity meters. (T.Y. 15894/40.)*

JOHANNESBURG.—March 4th. Railways and Harbours Administration. Two 10-ton and one 5-ton overhead electric travelling cranes. (T. 15509/40.)*

February 22nd. Public Works Department. 300-kVA transformer. T. 15707/40.)* Conduit tube fittings. (T. 15898/40.)

March 11th. Three 20-ton overhead electric travelling cranes. (T. 15508/40.)*

March 14th. Voltmeters, ammeters. milliammeters, and current transformers. (T. 15899/40.)*

March 16th. Stores Department. Street-lighting fittings. (T. 15896/40.)*

Stoke-on-Trent.—February 14th. Electrical Engineer's Department. Mains and cables, high-voltage truck type substation switchgear, transformers and meters for one year. (January 19th.)

Swansea.—February 19th. Electricity Department. Electrical materials for one year. (February 2nd.)

Turton.—February 24th. U.D.C. Electrical materials for twelve months. (February 2nd.)

Wolverhampton.—February 24th. Corporation. Electrical engineering stores for one year. (See this issue.)

Worcester.—February 24th. Electricity Department. Electrical materials for one year. (See this issue.)

Orders Placed

Cardiff.—Electricity Committee. Accepted. Skeleton control board for power station (£1,181).—G.E.C.

Dundee.—Electricity Committee. Accepted. Lighting, heating and power installations at the generating station (£2,058).—Sturrock & Murray, Ltd. The lowest tender was £2,017, but Sturrock and Murray's offer was chosen on the casting vote of the convener.

Ealing.—Electricity Committee. Accepted. Bus-bar extensions and metering panel for Dean Gardens sub-station (£976).—A. Reyrolle & Co. Two switch pillars.—Ferguson, Pailin.

East Ham.—Works Committee. Accepted. Electric vehicle battery (£207).—Britannia Batteries.

Glasgow.—Housing Committee. Accepted. Modernisation of fifteen lifts belonging to the City Improvements Department (£12,338).—Etchells, Congdon & Muir.

Electricity Committee. Accepted. Two 6,000-kVA transformers (£5,036).—Bruce Peebles & Co.

Health Committee. Accepted. Modernising bed hoist at Baird Street Auxiliary Hospital (£385).—Waygood-Otis.

Cleansing Committee. Accepted. Electric traction batteries (£5,676).—Tudor Accumulator Co.

Manchester. — Electricity Committee. Accepted. Modifications to earthing transformer, Stuart Street station.—Metropolitan-Vickers Electrical Co. High-voltage appliances, &c., Barton power station. — British Thomson-Houston Co. 6.6-kV switchgear, Stuart Street station, and 33-kV switchgear.—Ferguson, Pailin. 33-kV switchgear, Stuart Street station.—A. Reyrolle & Co. 33-kV cable.—Callender's Cable & Construction Co. Re-wiring work.—E. M. Evans & Son. Mercury-arc rectifiers.—Electric Construction Co.; English Electric Co. Conversion of goods lifts.—Waygood-Otis.

Health Committee. Accepted. Mobile X-ray unit.—Victor X-ray Corporation.

Warrington.—Sanitary Committee. Accepted. Two electric vehicle batteries.—Chloride Electrical Storage Co.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Alloa.—Cleansing and decontamination centre to cost £1,600; burgh surveyor.

Ashington.—Pithead baths for Miners' Welfare Committee; J. H. Forshaw, architect, Miners' Welfare Committee, Romney House, Tufton Street, London, S.W.1.

Ayrshire. — New building to cost £30,861 to replace St. Michael's College, Irvine, destroyed by fire; architect, County Council, Ayr.

Bath.—New premises, for National Hospital for Rheumatic Diseases.

Birmingham.—New licensed premises, for Ansell's Brewery, Ltd., at corner of Groveley Lane and Longbridge Lane, Cofton Hackett; also at Gossey Lane and Mackadown Lane, Lea Hall, and in Bromford Lane.

Licensed premises for Mitchells & Butlers, Ltd., Cape Hill Brewery, Smethwick, in New Road, Firs estate, Castle Bromwich.

Market completion, Edgbaston Road (£30,000); city engineer.

Cleansing station, Northfield; city engineer.

Bridgefoot (CUMBERLAND).—Factory, for Nestlé's Milk Products, 6, Eastcheap, London, E.C.3.

Cambridge.—School shelters (£10,000); G. W. Teasdale, architect, Guildhall.

Cambridgeshire.—Maternity home at County Infirmary, for C.C.; county architect, Shire Hall, Cambridge.

Chelmsford.—Electric goods lift, High Street; Marks & Spencer, Ltd.

Cheshire.—Senior mixed school, Frodsham, for E.C.; F. Anstead Browne, county architect, The Castle, Chester.

Chester-le-Street.—Laundry at the isolation hospital, for the Joint Hospital Board; E. M. Lawson, architect, Barras Buildings, Barras Bridge, Newcastle-on-Tyne.

Consett (Co. DURHAM).—Public house, Consett Park Cottages, for Westoe

(Continued on next page.)

TRADE MARK APPLICATIONS

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from January 31st:—

Ferguson. No. 603048. Class 9 (IV). Wireless telephone receiving sets.—Ferguson Radio Corporation, Ltd., 25-27, Oxford Street, London, W.1.

Lumalite. No. 609430. Class 9 (IV). Scientific instruments, wireless and telephonic apparatus and instruments, vacuum cleaning apparatus, domestic floor polishing machines, and dust extractors, &c., all being electrically operated.—John Barker & Co., Ltd., 83, Kensington High Street, London, W.8.

Loewe Radio (lettering and design). No. 606985. Class 9 (IV). Complete apparatus for sending, transmitting and amplifying wireless telegraphy and telephony, complete television transmitting and receiving apparatus, radio gramophones complete, Braun tubes, cathode-ray tubes, oscillographs, electric valves, photo-electric cells, &c.—The Loewe Radio Co., Ltd., 3-4, Clement's Inn, London, W.C.2.

Euranamron. No. 609971. Class 9 (IV). Wire for electrical purposes.—The Scott Insulating Wire Co., Ltd., Queensland Works, Westmoreland Road, London, N.W.9.

Breweries; J. J. Eltringham, architect, Derwent Street, Blackhill, Co. Durham.

Coventry.—Citadel, Spons Street; Property Department (J. W. H. Vint, surveyor), Salvation Army, International Headquarters, 101, Queen Victoria Street, London, E.C.4.

Cupar.—New fire station; burgh architect.

Ealing.—Alterations to factory, Hanger Lane; S. Wolf & Co., Ltd.

East Ham.—Additional storey, High Street; W. & C. French, Ltd.

East Preston (SUSSEX).—Church, for Chichester Diocesan Fund; Canon W. G. Bell, secretary, Hove, Sussex.

Edinburgh.—Extensions to works in Albion Road, for Redpath, Brown & Co., Ltd.

Bakery extensions, Oakfield Bakery, Pleasance; Young Bros. (Bakers), Ltd.

Eire.—COUNTY MAYO.—School, Ballyhaunis, and proposed school, Swinford, for E.C.; county architect.

Ewell.—Reconstruction of Glyn Arms Hotel, Cheam Road; Hayward and Maynard, architects, 14, John Street, Adelphi, London, W.C.2.

Feltham.—Dwellings, Poor's Land, for U.D.C.; surveyor, Council Offices.

Fenton.—Premises, for Fenton Working Men's Club, Fountain Street.

Gateshead. — Rebuilding Grey Horse Inn, High Street (£2,000); manager.

Glasgow. — Houses (112), Ardlenea Street; housing director.

Tenements and hostel, Jane Street and Porter Street; housing director.

Guildford.—Works extensions, Chestnut Avenue; Coombs & Sons, Ltd.

Hanley (STAFFS).—Shop and showroom premises, 3, Parliament Row, Hanley, for Henry's, Ltd., multiple store merchants, Market Street, Manchester; A. Cotton, Son & Hulme, architects, Piccadilly, Tunstall, Stoke-on-Trent.

Workshop, for William Walker & Sons, Brook Street.

Haverfordwest.—Housing estate, Camrose, for R.D.C.; surveyor, Council Offices.

Hebburn-on-Tyne. — Three first-aid posts; J. M. Black, jun., contractor, Grange Road West, Jarrow-on-Tyne.

Hendon. — Extensions to factory; Charles Wright, Ltd., The Forum, Edgware.

Hetton.—Sixteen houses on the Peat Carr estate; U.D.C. surveyor.

Hinckley.—Extensions to factory, for Burgess Products, Ltd., Brookfield Road.

Hyde.—Extension to tuberculosis pavilion, Borough Hospital; borough surveyor.

Kidderminster.—Factory development, Stourport Road; Smethwick Stamping Co., Ltd., Bridge Street, Smethwick.

Leek.—New admission section and villas as extensions to Cheddleton Mental Hospital (£22,778); K. L. Murray, county architect, County Offices, Stafford.

Liverpool.—Tram depôt and bus garage, Norris Green, for T.C.; borough engineer.

Extension to factory, Brasenose Road, for S. & H. E. Hill, jute manufacturers, 17, Brasenose Road; W. Pecorini, 4, Caithness Road, Garston, Liverpool, 18.

Infants' school, Roby; Father M. O'Sullivan, St. Aloysius, Roby.

London.—BETHNAL GREEN. — Dwellings, James Street area; Sutton Dwellings Trust.

KENSINGTON.—Completion of dwellings, Bramley Road (£13,000); borough engineer.

Macclesfield.—Extensions, Crompton Road Mill, for Bullock, Thornhill and Son, Ltd., Chester Road Dyeworks.

Mansfield.—Offices, Nottingham Road; Boneham & Turner, Ltd.

Market Harborough.—New maternity block, Market Harborough Hospital; F. Hickman & Son, contractors, Northampton Road, Market Harborough (£6,500).

Merthyr.—Extensions to factory for Hall Telephone Accessories, Ltd.

Morpeth. — Shop and café, Bridge Street, for W. S. Sanderson; R. Carse and Son, builders, Oldgate, Morpeth.

Newbury.—New factory for Opperman Gears, Ltd., Hambridge Road, Clerkenwell.

Newcastle (STAFFORDSHIRE). — Heating scheme, Newcastle Hospital, for Joint Hospital Board; N. W. Slater, architect to the Board.

Newcastle-on-Tyne. — Ambulance and A.F.S. accommodation, Erick Street, for the City Council; city estate and property surveyor, Town Hall.

Northampton.—Extensions to works, for Hanwell Engineering Co., Ltd., Countess Road.

Northamptonshire. — Decontamination depôts, for C.C.; G. H. Lewin, county architect, County Hall, Northampton.

Northumberland.—Dwellings at Willington Square, for Northumberland Aged Miners' Homes Association; W. Dixon and Son, architects, 1, Collingwood Street, Newcastle-on-Tyne.

Public shelters at Newbiggin, Bedlington, Morpeth and Ashington; county surveyor, County Offices, Mitford Road, Morpeth.

Air-raid shelters at the Cambois and Earsdon Schools for the C.C.; county architect.

North Shields.—Premises for the British Sailors' Society (£1,000); W. Stockdale, architect, 73, Howard Street, North Shields.

Nuneaton. — Fire and ambulance station, Newtown Road; borough engineer.

Oldham.—New premises for Oldham Brewery Co., Ltd., Albion Brewery, Coldhurst Street, at Chadderton; Taylor, Roberts and Bowman, architects, 10, Clegg Street, Oldham.

Pembroke.—Factory, site of Old Tanyard, for British Rabbit Industries Co. (Pembroke), Ltd.; G. Wheeler, managing director.

Peterborough. — New police station; borough engineer.

Plymouth.—Houses, Torr Close; C. Glenwalker.

Store, Prince Rock; E. G. Acheson, Ltd.

Rainhill.—New dispensary at County Mental Hospital; Owens & Son, architects, 3, Crosshall Street, Liverpool, 1.

Scarborough.—Air-raid shelters, Prince of Wales Terrace and the Car Park, Peasholm; borough engineer.

Sheffield.—Factory, Moore Street; Champion & Co.

Houses (12), Hunter's Lane; S. Bannister.

Extensions, Central ambulance station (8,000); city engineer.

Works extensions, Garden Street; T. R. Ellin, Ltd.

Works additions, Penistone Road; R. W. Carr & Co.

Works additions, Artisan Road; S. Osborn & Co., Ltd.

Shipley.—Works extensions, Wrose Brow Road; Lee & Crabtree, Ltd.

Shropshire.—Junior school at Wellington and elementary school at Cosford; county architect, Shrewsbury.

Southgate.—Garages, destructor works (£2,000); borough engineer.

South Shields.—An A.R.P. shelter for 200 people at the Scala Theatre; John Reid, borough engineer, Town Hall, South Shields.

Staffordshire.—Completion of County Technical College, Stafford (£43,500); G. C. Lowbridge, county architect, County Offices, Stafford.

Extensions, Groundslow Sanatorium, for Joint Tuberculosis Hospital Board; K. L. Murray, county architect, County Buildings, Stafford.

Stanwell.—Business premises, Bedfont Road; Staines Co-operative Society, Ltd.

Stirlingshire. — School, Westquarter, and R.C. school, Raploch; county architect, Stirling.

Stockport.—Premises, West Reddish, for Peter Walker & Son, Ltd., Empress Brewery, 382, Chester Road, Old Trafford, Manchester.

Stoke-on-Trent.—Commercial garage, High Lane, Burslem; J. Clark, architect, Market Place, Burslem.

School, Blurton (£13,756), and senior school, Carmountside (£6,765), for E.C.; borough architect.

Wainford.—Development of housing site, Stoven, for R.D.C.; F. J. Meen, architect, Station Road, Beccles.

Warrington.—Pumping station, Howley; borough engineer.

Works additions, Ellesmore Street; T. Locker & Co., Ltd.

Warwickshire.—Police station, Coleshill, for Standing Joint Committee; A. C. Bunch, county architect, Shire Hall, Warwick.

Wellington (SALOP).—Houses; R.D.C. surveyor.

Welwyn.—New houses; Welwyn Garden City, Ltd.

West Bromwich.—Factory extensions, Sheepwash Lane; Gt. Bridge Foundry Co.

Wisbech.—Rebuilding factory, Lynn Road; Wisbech Produce Canners, Ltd.

Generator room, Brigstock Road; Steward and Patteson.

Wolverhampton.—Extension to factory, for A. Bellamy & Co., Hospital Street; A. T. & Bertram Butler, architects, 14, Waterloo Road, Wolverhampton.

Worthing.—Additions, Charmandean School, First Avenue; H. C. Woolledge.

Factory, Angola Road; Corry & Corry, surveyors.

York.—Hospital completion (£170,529); city engineer.

Proposed U.S.A. Grid

CONFERENCES have recently been taking place in Washington with the officials of some 50 large public utility companies operating in the eastern part of the United States to explore the possibilities of constructing a series of high-voltage lines interconnecting the larger generating plants and power-consuming centres in this area, including both private and public developments.

While, up to the present, no definite plan has actually been made public, the proposals include connecting links that would make it possible to interchange power whenever necessary between such major load centres as Boston, New York, Philadelphia, Washington, Buffalo, Cleveland, Detroit, Chicago, St. Louis and possibly Birmingham. Connections would be made with all major generating stations, both steam and hydro-electric, without regard to whether they are controlled by private capital, municipalities, or the Federal Government. According to preliminary estimates, the construction would cost approximately £100,000,000.

Objections to the plan have been raised owing to the ample generating capacity now in existence or under construction in each of the localities to meet possible future demands. It is also contended that the expenditure of such a large amount would impose an unnecessary financial burden upon consumers of electricity. The advocates of the scheme take the view that the future growth of power demand will be at an accelerating rate and that the rate of construction can be adjusted to actual needs for the new facilities. They are also understood to be relying strongly on the national defence argument, on the assumption that, even though temporarily uneconomic, the grid can be justified as a safeguard against the power shortages experienced by American industry during the last war.